

**CONNECTICUT RIVER BASIN  
SPRINGFIELD, MASSACHUSETTS**

**VAN HORN PARK LOWER DAM  
MA 00571**

**PHASE 1 INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM**

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**DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION, CORPS OF ENGINEERS  
WALTHAM, MASS. 02154**

**JULY 1978**

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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| 19. KEY WORDS (Continue on reverse side if necessary and identify by block number)<br>DAMS, INSPECTION, DAM SAFETY,<br>Connecticut River Basin<br>Springfield, Massachusetts                                                                                                                                                                                                                                                     |                       |                                                                |
| 20. ABSTRACT (Continue on reverse side if necessary and identify by block number)<br>This investigation of the dam does not indicate conditions which would constitute<br>an immediate hazard to human life or property. The dam does have a number<br>of deficiencies and unknown factors whose causes and circumstances are not<br>sufficiently defined to assess the performance of the embankment under flood<br>conditions. |                       |                                                                |



DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION, CORPS OF ENGINEERS  
424 TRAPELO ROAD  
WALTHAM, MASSACHUSETTS 02154

REPLY TO  
ATTENTION OF  
NEDED

OCT 10 1978

Honorable Michael S. Dukakis  
Governor of the Commonwealth of  
Massachusetts  
State House  
Boston, Massachusetts 02133

Dear Governor Dukakis:

I am forwarding to you a copy of the Van Horn Park Lower Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

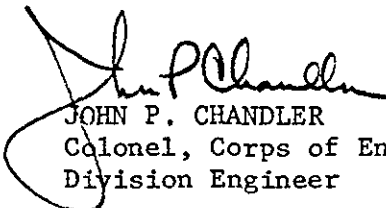
A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, the City of Springfield, c/o Superintendent of Parks and Maintenance, 15 Fayette Street, Springfield, Massachusetts 01118.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for your cooperation in carrying out this program.

Sincerely yours,

Incl  
As stated

  
JOHN P. CHANDLER  
Colonel, Corps of Engineers  
Division Engineer

**VAN HORN PARK LOWER DAM  
MA 00571**

**CONNECTICUT RIVER BASIN  
SPRINGFIELD, MASSACHUSETTS**

**PHASE 1 INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM**

## PHASE I REPORT

### NATIONAL DAM INSPECTION PROGRAM

Inventory No.: MA 00571  
Name of Dam: VAN HORN PARK LOWER DAM  
Town Located: SPRINGFIELD  
County Located: HAMPDEN  
State Located: COMMONWEALTH OF MASSACHUSETTS  
Stream: NOT APPLICABLE  
Date of Inspection: 1 JUNE 1978

### ASSESSMENT

Phase I investigation of Van Horn Park Lower Dam does not indicate conditions which would constitute an immediate hazard to human life or property. Based on engineering judgment and the performance of the outlet works and earth embankment, the project is considered to be adequate under present conditions. The dam project, however, does have a number of deficiencies and unknown factors whose causes and circumstances are not sufficiently defined to assess the performance of the embankment under flood conditions. In addition, the assessable deficiencies if not thoroughly remedied and monitored have the potential for developing into hazardous conditions.

Although the embankment is not in imminent danger under present conditions, additional investigations need to be undertaken by the owner within a short time to determine and evaluate the following: subsurface conditions, soil parameters, zoning of the embankment materials, nature of seepage conditions, and hydraulic capabilities of the conduit. These investigations should include, but not necessarily be limited to, subsurface exploration and testing, and piezometric observations.

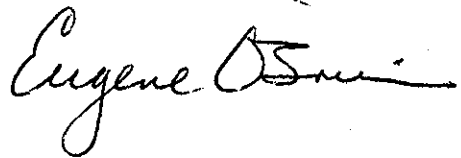
Because there are no data on Probable Maximum Floods for a drainage area of this size and condition, a design flood hydrograph was synthesized for the contributing area. The resulting inflow hydrograph has peak discharge of 925 cfs and a runoff volume equivalent to 11.5 inches of which 9.8 inches enters the Lower Pond in 6 hours. Routing this flood through the reservoir using computerized techniques, resulted in a maximum discharge of

258 cfs with the pool rising to within 5 feet of the dam crest.

Since the dam is not expected to be overtopped with an inflow to the pond equal to one half the Probable Maximum Flood, it is considered that the spillway is adequate from a hydrologic and hydraulic standpoint.

In addition to the investigation recommended above, certain measures are recommended for short term implementation, and others as part of a normal maintenance program. These measures are as follows:

- Programs for observing and monitoring seepage and structural movements.
- Repair and maintenance of dam and appurtenant structures.
- Programs for operation, maintenance and inspection.

A handwritten signature in cursive script, reading "Eugene O'Brien".

Eugene O'Brien, P.E.  
New York No. 29823

This Phase I Inspection Report on Van Horn Park Lower Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.



CHARLES G. TIERSCH, Chairman  
Chief, Foundation and Materials Branch  
Engineering Division

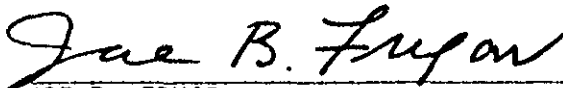


FRED J. RAVENS, Jr., Member  
Chief, Design Branch  
Engineering Division



SAUL COOPER, Member  
Chief, Water Control Branch  
Engineering Division

APPROVAL RECOMMENDED:



JOE B. FRYAR  
Chief, Engineering Division

JUL 14 1978

## PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

CONNECTICUT RIVER BASIN  
VAN HORN PARK LOWER DAM  
INVENTORY NO. MA 00571  
PHASE I INVESTIGATION REPORT

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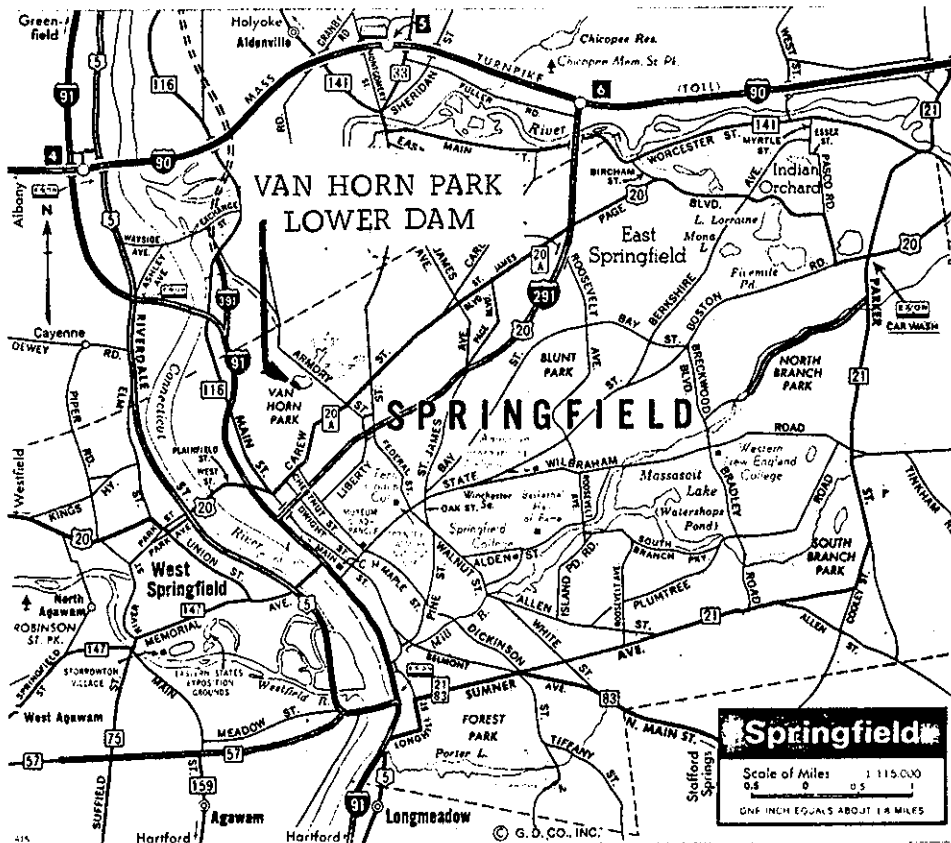
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① GENERAL OVERVIEW OF UPSTREAM SLOPE OF DAM



VICINITY MAP  
VAN HORN PARK LOWER DAM

[illegible]

TOPOGRAPHIC MAP  
VAN HORN PARK LOWER DAM

PHASE I INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM  
CONNECTICUT RIVER BASIN  
INVENTORY NO. MA 00571  
VAN HORN PARK LOWER DAM  
CITY OF SPRINGFIELD  
HAMPDEN COUNTY, COMMONWEALTH OF MASSACHUSETTS

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Tippetts-Abbott-McCarthy-Stratton has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Authorization and notice to proceed was issued to Tippetts-Abbott-McCarthy-Stratton under a letter of May 3, 1978, from Mr. Ralph T. Garver, Colonel, Corps of Engineers. Contract No. DACW 33-78-C-0298 has been assigned by the Corps of Engineers for this work.

b. Purpose

- (1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.
- (2) Encourage and prepare the States to initiate quickly effective dam safety programs for non-Federal dams.
- (3) To update, verify and complete the National Inventory of Dams.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam

The Van Horn Park Lower Dam is an earth dam about 600 feet long with a maximum height of 37 feet, a crest width of 18 feet. The upstream and downstream slopes of the embankment are 1 (V) to 3 (H), and 1 (V) to 2 (H), respectively. Both slopes are covered with a heavy growth of trees, bushes and shrubs.

Located approximately at the center of the dam is a pile supported reinforced concrete intake tower having outside dimensions of 34 feet high, 15 feet long, and 9 feet wide with intakes at El 139.5, El 146.5 and El 168.0. The intake at El 168 is at the top of the tower, the intake at El 146.5 is an orifice of 24 inch diameter, both are uncontrolled. The low level intake consists of a 12 inch diameter cast iron pipe, controlled by a manually operated non-rising stem gate valve. It enters the tower at El 139.5 through a gate valve inlet structure 36.33 feet upstream of the tower. The dimensions of the inlet structure are 4.33 feet long, 3.67 feet wide, 4.17 feet high.

From the intake tower a 72 inch diameter gunite lined tunnelled conduit passes through the dam terminating in a reinforced concrete stilling basin, which is 40 feet long and has an approximate surface area of 640 square feet and an average wall height of 9.3 feet. The floor of the basin slopes on 1 (V) to 2 (H) and contains 10 weepholes. Adjacent to the basin, on three sides, is a 2 ft thick zone of riprap 10 feet wide and a chain link fence, which at time of inspection, was completely torn down. The discharge from the stilling basin enters the City's storm sewer system through a 48 inch diameter reinforced concrete pipe which is located on the west wall of the stilling basin.

b. Location

The dam is located in the northern section of the City of Springfield approximately one mile east of the Connecticut River. Apparently the discharge from Van Horn Park Upper Pond constitutes the major portion of the inflow to the Lower Pond.

c. Ownership

The Van Horn Park Lower Dam is owned by the City of Springfield. The day to day operation and maintenance is managed by the Park Department, Forest Park Office, City of Springfield.

d. Purpose of Dam

The impoundment provided by the dam is for recreational purposes.

e. Design and Construction History

Original design and construction records are not available. In 1957, modifications to the dam were made to eliminate and plug an intake tower and outlet pipe and to replace them with the present intake tower, tunnel and stilling basin. The design modifications were carried out by Green Engineering Affiliates, Inc., Boston, Massachusetts. Construction records are not available for this modification.

f. Normal Operating Procedures

There are no normal operating procedures in existence. The low level 12 inch gate valve is operated occasionally for testing purposes. No

records are kept.

The outflow from the pond enters the City of Springfield's storm sewer system and then is discharged into the Connecticut River.

g. Size Classification

The dam is less than 40 feet high and has a storage capacity of less than 1000 acre-feet, therefore it is classified as a "small" dam.

h. Hazard Classifications

The dam is in the "high" hazard potential category due to the large number of dwellings and commercial properties downstream of the dam.

i. Operator

The person responsible for the day to day operation of the dam is:

Mr. Albert Poehler  
Superintendent of Parks and Maintenance  
15 Fayette Street  
Springfield, Massachusetts 01118  
Telephone No.: Home-413-778-4605  
Office-413-732-2181

### 1.3 PERTINENT DATA

#### a. Drainage Area

The Van Horn Park Lower Dam is one of two dams which controls the runoff from a depressed basin within the City of Springfield, Mass. The total area contributing to the dam is 0.50 square miles (320 acres) of which 0.41 square miles (262 acres) is partially controlled by the Van Horn Upper Dam located, about 1000 feet upstream. Of the 58 acres of drainage area between the two dams, about 23 acres is undeveloped park and 35 acres is developed urban area. A pond with a normal water area of about 6 acres is located within the park area and immediately above the Upper Dam. The water area may increase to about 17 acres at El 172, which is 2 ft below the dam and 4 ft above the spillway crest.

The urban area surrounding the park is served by storm sewers which carry the runoff from frequent storms away from the topographic basin. In a major storm the runoff will exceed the design capacity of the sewers, and excess runoff will flow overland to the pond.

The contributing drainage area between the two dams is only 18 percent of total drainage area but the park area between the dams is a potential flood control basin with a capacity equal to 77 percent of the total usable storage in Van Horn Park. The upper basin has sufficient storage to provide substantial regulation of the inflow to the Lower Pond.

#### b. Discharge at Damsite

The 1957 construction plans by Green Engineering Affiliates for the present outlet works contain the following note regarding past pond elevations: "Probable high water flood, August 1955, El 149.91; Probable high water level at one time, El 150.91". According to these same set of plans the spillway weir is designed for a discharge of 900 cfs but no design elevation is given. Computations made to verify the discharge capacity indicate a flow rate of 955 cfs with pool at El 172. If the entire spillway is treated as a closed pipe system with the entrance as an orifice, computations indicate the discharge capacity would not exceed 960 cfs, at a head of 6 feet, El 174.

#### c. Elevation (ft above MSL, Springfield Datum)

|                               |                |
|-------------------------------|----------------|
| Top of dam                    | 174            |
| Maximum pool-design structure | 168            |
| Full flood control pool       | Not Applicable |
| Recreation pool               | 147±           |
| Spillway crest (gated)        | Not Applicable |
| Upstream portal invert        |                |
| diversion tunnel              | Not Applicable |

|                                           |                                                                                                                       |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| Downstream portal invert                  |                                                                                                                       |
| diversion tunnel                          | Not Applicable                                                                                                        |
| Streambed at centerline of dam            | Not Applicable                                                                                                        |
| Maximum tailwater                         | Not Applicable                                                                                                        |
| d. <u>Reservoir</u>                       |                                                                                                                       |
| Length of maximum pool                    | 750± feet                                                                                                             |
| Length of recreation pool                 | 750± feet                                                                                                             |
| Length of flood control pool              | Not Applicable                                                                                                        |
| e. <u>Storage (acre-feet)</u>             |                                                                                                                       |
| Recreation pool                           | 219 feet                                                                                                              |
| Flood control pool                        | Not Applicable                                                                                                        |
| Design surcharge                          | Unknown                                                                                                               |
| Top of dam                                | 316                                                                                                                   |
| f. <u>Reservoir Surface (acres)</u>       |                                                                                                                       |
| Top of dam                                | Unavailable                                                                                                           |
| Maximum pool                              | 17± (at El 172)                                                                                                       |
| Flood control pool                        | Not Applicable                                                                                                        |
| Recreation pool                           | 6±                                                                                                                    |
| Spillway crest                            | 14.7±                                                                                                                 |
| g. <u>Dam</u>                             |                                                                                                                       |
| Type                                      | Earth                                                                                                                 |
| Length                                    | 600 (approx.)                                                                                                         |
| Height                                    | 37 feet                                                                                                               |
| Top width                                 | 18 feet                                                                                                               |
| Side Slopes - U/S                         | 1(V): 3(H)                                                                                                            |
| D/S                                       | 1(V): 2(H)                                                                                                            |
| Zoning                                    | Unknown                                                                                                               |
| Impervious core                           | From subsurface information it appears there is an impervious core about 25 feet high, but lateral extent is unknown. |
| Cutoff                                    | Unknown                                                                                                               |
| Grout curtain                             | Unknown                                                                                                               |
| Other                                     | None                                                                                                                  |
| h. <u>Diversion and Regulating Tunnel</u> |                                                                                                                       |
| Type                                      | Not Applicable                                                                                                        |
| Length                                    | Not Applicable                                                                                                        |
| Closure                                   | Not Applicable                                                                                                        |
| Access                                    | Not Applicable                                                                                                        |
| Regulating facilities                     | Not Applicable                                                                                                        |

i. Spillway

|                 |                      |
|-----------------|----------------------|
| Type            | Shaft                |
| Length of weir  | 36 feet (equivalent) |
| Crest elevation | 168                  |
| Gates           | None                 |
| U/S channel     | None                 |
| D/S channel     | None                 |
| General         | None                 |

j. Regulating Outlets

Located approximately at the center of the dam is a pile supported reinforced concrete intake tower having outside dimensions of 34 feet high, 15 feet long, and 9 feet wide with intakes at El 139.5, El 146.5 and El 168.0. The intake at El 168 is at the top of the tower, the intake at El 146.5 is an orifice of 24 inches in diameter, both are uncontrolled. The low level intake consists of a 12 inch diameter cast iron pipe, controlled by a manually operated non-rising stem gate valve. It enters the tower at El 139.5 through a gate valve inlet structure 36.33 feet upstream of the tower inlet. The dimensions of the inlet structure are 4.33 feet long, 3.67 feet wide, 4.17 feet high.

From the intake tower a 72 inch diameter gunite lined tunnelled conduit passes through the dam terminating in a reinforced concrete stilling basin which is 40 feet long and has an approximate surface area of 640 square feet with an average wall height of 9.3 feet. The floor of the basin slopes on 1 (V) to 2 (H). The discharge from the stilling basin enters the City's storm sewer system through a 48 inch diameter reinforced concrete pipe (invert El 124), which is located on the west wall of the stilling basin.

## SECTION 2 - ENGINEERING DATA

### 2.1 DESIGN

Design data, drawings or specific memoranda are not available for the original construction of the dam. However there are contract drawings available for the alterations which were designed in 1957 by Green Engineering Affiliates Inc., Boston. (See Appendix)

These drawings are:

- a. Proposed Outlet Works, Plan and Details
- b. Proposed Outlet Works, Lower Pond Outlet-Intake Tower
- c. Proposed Outlet Works, Borings and Miscellaneous Details
- d. Proposed Outlet Works, Stilling Basin and Manhole Details

Information on subsurface conditions at the intake tower, outlet conduit and stilling basin is available from eight borings drilled for the modification study. The boring logs are shown on the drawings given in (c) above. There are no test results available from this subsurface exploration program. The boring information has been used to develop a soils profile which is shown in the Appendix.

### 2.2 CONSTRUCTION RECORDS

There are no detailed construction records available.

### 2.3 OPERATION RECORDS

No operation records are available and there is no daily record kept of pool elevation or rainfall at the dam site.

### 2.4 EVALUATION OF DATA

Existing information was made available by Department of Streets and Engineering, Springfield, Mass.; Office of the County Commissioners, County of Hampden; and Department of Environmental Quality Engineering, Division of Waterways, Boston, Mass. The drawings available contain information which indicates conditions in 1957 when the modifications were designed. They do not indicate "as built" conditions. However the data reviewed are considered adequate for this Phase I inspection and evaluation.

## SECTION 3 - VISUAL INSPECTION

### 3.1 FINDINGS

#### a. General

A visual inspection of the Van Horn Park Lower Dam was made on June 1, 1978. The weather was sunny, temperature between 75° and 80°F. The last rainfall, a heavy shower of short duration, occurred the night before the inspection. At the time of the inspection the pool level was at approximately El 146.5+ which is approximately 1/2 inch above the invert elevation of the orifice inlet in the intake tower.

#### b. Embankment

Both slopes of the embankment are heavily overgrown with vegetation. There is evidence of erosion caused by trespassing; reportedly by trail bikes. The latter have caused severe rutting and depressions on the crest and along several transverse paths on both slopes. Except for these conditions, the vertical and horizontal alignment of the crest appears to be good. There is other minor erosion on the slopes, however, no sloughing or surface cracks were noticed because of heavy vegetation. It should be noted that one of the drawings prepared for the 1957 alterations, indicates a bench approximately mid-height of the downstream slope. During the inspection, no evidence of this bench was found. In addition the lower portion of the downstream slope appears to be substantially steeper, (approximately 1(V): 1 1/2 (H), than shown on the drawing.

A wet area is located at a low point near the downstream toe, 100 feet south of the stilling basin. It was not possible to determine whether the wet area is caused by seepage or surface runoff which appears to collect at this point. On the north side of the basin, parallel to the downstream toe, is a brook which carries the water discharged through the low level outlet of the Van Horn Park Upper Pond. The brook flows in a natural bed along the toe, then a trapezoidal concrete channel, which empties into the stilling basin. (See photograph).

#### c. Appurtenant Structures

A reinforced concrete intake tower, located at approximately the center of the dam, is generally, in good condition. The 12-inch gate valve inlet is submerged and the valve is closed, it was therefore impossible to determine whether the inlet was clogged. It was reported the gate valve had not been operated in some time.

Water was flowing slightly above the invert of the orifice; a small amount of debris was observed to be caught on the trash rack. The intake at the top of the tower appeared to be clear. It was reported that the pool level

has never reached the high level.

The 72-inch diameter tunnelled conduit between the intake tower and stilling basin has a galvanized steel plate lining which is covered by gunite. The cross-section of the plate conduit was observed to be elliptical and asymmetrically flattened near the crown along the portion which crosses the dam centerline. Condition of the gunite inside the conduit and that of the contact between the extrados of the steel plate lining and the embankment material could not be examined. There was only a small amount of debris along the conduit invert.

The stilling basin appears to be in fair condition with some minor spalling and erosion of concrete along the floor and walls. There is some algae growth on the wall directly below the brook inlet. Only two drain holes in the floor of the basin were visible and showed no evidence of functioning. The other drains were covered with large quantity of debris, some of which was quite large. This debris almost completely covered the upper end of the 48-inch diameter outlet pipe but did not appear to hinder low flow. (See Photograph). The riprap which surrounds the stilling basin was completely covered by soil and vegetation. At the lower end of the stilling basin the riprap has been displaced vertically about 3 feet.

### 3.2 EVALUATION OF OBSERVATIONS

Visual observations made during the inspection revealed several deficiencies which at present do not adversely affect the adequacy of the dam. However, the deficiencies should be corrected before further deterioration occurs which could create hazardous conditions in the future. Recommended measures to improve these conditions are given in SECTION 7.

## SECTION 4 - OPERATION AND MAINTENANCE PROCEDURES

### 4.1 PROCEDURES

There are no established procedures for operation of the 12 inch gate valve and no established maintenance program for the dam or appurtenance structures.

### 4.2 MAINTENANCE OF DAM

There is no operation or maintenance manual for the project. There is no program of inspections by any City personnel. There is a statewide program of inspection established several years ago by the Department of Environmental Quality Engineering, Division of Waterways. A copy of their last inspection report, November 1976, is given in the Appendix.

### 4.3 MAINTENANCE OF OPERATING FACILITIES

There is no established maintenance program for the operating facilities. It is reported that the 12 inch gate valve is operated only occasionally.

### 4.4 WARNING SYSTEMS IN EFFECT

There is no warning system in effect or contemplated.

### 4.5 EVALUATION

Maintenance of the dam and appurtenant structures is virtually nonexistent.

## SECTION 5 - HYDRAULIC/HYDROLOGIC

### 5.1 DRAINAGE AREA CHARACTERISTICS

The Van Horn Park Lower Dam is one of two dams which controls the runoff from a depressed basin within the City of Springfield, Mass. The total area contributing to the dam is 0.50 square miles (320 acres) of which 0.41 square miles (262 acres) is partially controlled by the Van Horn Upper Dam located about 1000 feet upstream. Of the 58 acres of drainage area between the two dams about 23 acres is undeveloped park and 35 acres is developed urban area. A pond with a normal water area of about 6 acres is located within the park area and immediately above the dam. The water area may increase to about 17 acres at El 172, which is 2 ft below the dam and 4 ft above the spillway crest.

The urban area surrounding the park is served by storm sewers which carry the runoff from frequent storms away from the topographic basin. In a major storm the runoff will exceed the design capacity of the sewers, and excess runoff will flow overland to the pond.

The contributing drainage area between the two dams is only 18 percent of total drainage area but the park area between the dams is a potential flood control basin with a capacity equal to 77 percent of the total usable storage in Van Horn Park. The upper basin has sufficient storage to provide substantial regulation of the inflow to the Lower Dam.

### 5.2 SPILLWAY CAPACITY

The spillway is a so-called shaft type consisting of a rectangular tower, 30 ft high having an inside opening 12 ft by 6 ft. The shaft is connected to a 72-inch diameter gunited conduit which passes through the base of the dam. The top of the tower is at El 168 or 6 ft below the crest of the dam. The opening at the top of the tower acts as a weir with a crest length of 36 ft.

The bottom of the pond is drained by a 12-inch pipe connected to a gate valve. The discharge capacity of this pipe has been neglected in evaluating the discharge capacity of the dam, since it would be ineffective in a major flood.

A 24-inch diameter uncontrolled orifice is located in the tower 8.5 ft above the bottom. This outlet is for low-flow regulation and passes only about 70 cfs when the main spillway is operating.

According to the construction plans the spillway weir is designed for a discharge of 900 cfs but the design elevation is not given. Computations

indicate a discharge of 955 cfs at El 172 or a head of 4 ft. Without a model test it is not possible to make a reliable estimate of the discharge capacity of the spillway at heads above 4 ft. At higher heads the overall jets from the four sides would interfere and flow from the narrow ends would become ineffective. A computation, treating the entire spillway as a closed pipe system and the entrance as an orifice, indicates that the discharge capacity would not exceed 960 cfs at a head of 6 ft.

A trash cage of reinforcing bars exists on the spillway crest which reduces spillway effectiveness, but probably by not more than 10 percent unless blocked by debris. At high heads and with debris accumulation some failure of the trash bars can be expected. The flood routing (see Section 5.6) indicates that only 20 percent of the spillway capacity will be needed under one half the Probable Maximum Flood, and therefore the inefficiency of the spillway will not be a serious problem.

### 5.3 RESERVOIR CAPACITY

For purposes of the hydrologic analysis, the storage has been assumed to be zero at El 146.5, the centerline of the low-flow discharge orifice in the spillway tower. At the spillway crest the usable storage is 219 acre-feet and at the crest of the dam the storage is 316 acre-feet. These storage figures are equivalent to 8.2 and 11.9 inches of runoff, respectively, from the gross drainage area of 0.5 square mile.

### 5.4 FLOOD OF RECORD

There are no records of flow from this small drainage area. The construction plans for the present spillway have the following note regarding past pond elevations: "Probable high water flood, August 1955, El 149.91; probable high water level at one time, El 150.91".

### 5.5 DESIGN FLOOD

Because there are no data on a Probable Maximum Flood for an area of 0.5 square mile, and particularly for a partially urbanized area, it was necessary to synthesize a design flood hydrograph for the contributing area. Initially a depth-duration relation for maximum probable point rainfall (10 square mile area) for durations from 6 hours to 24 hours was taken from Weather Bureau sources. (1) The distribution of the rainfall for durations from 1 to 6 hours was

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(1) Generalized Estimates of Maximum Possible Precipitation over the United States East of the 105th Meridian, Hydrometeorological Report No. 23, 1947.

based on data in a publication of the World Meteorological Organization. (2) Increments of depth from the depth duration relation at one-hour intervals, equal to one half the Maximum Probable Rainfall were arranged in a probable storm sequence given below:

| <u>Time</u><br><u>(hours)</u> | <u>Precipitation</u><br><u>(inches)</u> |
|-------------------------------|-----------------------------------------|
| 1.0                           | 0.16                                    |
| 2.0                           | 0.50                                    |
| 3.0                           | 1.10                                    |
| 4.0                           | 2.65                                    |
| 5.0                           | 4.50                                    |
| 6.0                           | 1.40                                    |
| 7.0                           | 0.85                                    |
| 8.0                           | 0.16                                    |
| 9.0                           | <u>0.16</u>                             |
|                               | 11.48                                   |

Since runoff to the pond area will be overland flow from a narrow strip of land (averaging about 1500 ft in width), it was assumed that there would be no significant lag time and the runoff rate would be computed directly from the rate of precipitation. Also because about 82 percent of the contributing area will be impervious urban area or water area, no infiltration losses were deducted.

Because of the effect of storage at the Upper Dam, the design hydrograph was developed in two parts. The design storm was first applied to the 0.41 square mile drainage area of the Upper Dam and resulting hydrograph routed through the storage. The upper reservoir filled to within 0.2 foot of the crest of the dam and the outflow reached a peak discharge of 755 cfs.

The inflow to the Lower Dam consists of the modified hydrograph of runoff from the Upper Dam plus the runoff resulting from the Design Storm on the drainage area of 58 acres contributing directly to the Lower Pond. The combined inflow hydrograph has a peak discharge of 925 cfs, and a total volume equivalent to 11.5 inches of runoff, of which 9.8 inches enters the Lower Pond in 6 hours.

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(2) Manual for Estimation of Probable Maximum Precipitation, World Meteorological Organization, Operation Hydrology Report No. 1, 1973.

## 5.6 OVERTOPPING POTENTIAL

The adequacy of the spillway capacity has been tested by routing the combined inflows from the synthesized Flood, which was one half the Probable Maximum, through the lower pond using a computerized routing technique. The water surface was assumed to be at El 146.5, the centerline of low-flow orifice, at the beginning of flood inflow. The water surface rose to El 169, or one foot above the top of the shaft spillway. The peak discharge was 188 cfs over the weir plus 70 cfs from the orifice or a total of 258 cfs. There was 5 feet of freeboard from the maximum water surface to the crest of the dam.

## 5.7 EFFECT OF FAILURE OF UPPER DAM ON LOWER DAM

As the synthesized Design Flood (one half the Probable Maximum Flood) was routed through the basin it was shown that the Upper Pond level would rise to within 0.2 feet of the crest of the Upper Dam. It was therefore considered necessary to perform a trial computation to determine the effect of failure of the Upper Dam on the stability of the Lower Dam.

As the Upper Dam is planted with trees, it was assumed that the roots of these trees would offer resistance against instantaneous failure caused by overtopping or seepage. Therefore, it was assumed that the surge due to failure would build up to a peak in 30 minutes and that the pond would be emptied in 1.5 hours from the beginning of failure. The hydrograph of failure was assumed to be a triangle with a peak of about 1500 cfs.

Failure was assumed to begin when the routed Design Flood reached the peak elevation and outflow at the Upper Dam. The inflow to the Upper and Lower Ponds from the Design Flood was assumed to continue during the failure. The peak inflow to the Lower Pond was computed to be 1840 cfs.

The inflow from the upstream surge caused the Lower Pond to rise from El 160.6 to El 171.9 in two hours. The spillway plus the low-flow outlet reached a peak outflow of 981 cfs. A freeboard of 2.1 feet remained between the maximum water surface and the crest of the dam.

It is considered that the Lower Dam and ponding area are adequate to withstand a flood surge from failure of the Upper Dam.

## 5.8 EVALUATION

The large amount of storage in the Lower Dam is effective in storing most of the modified outflow from the Upper Dam plus the small inflow between the dams. With 5 feet of freeboard remaining at the peak of the routed flood, which is equivalent to one half the Probable Maximum Flood, it is considered that the the spillway is adequate from a hydrologic viewpoint.

## SECTION 6 - STRUCTURAL STABILITY

### 6.1 EVALUATION OF STRUCTURAL STABILITY

#### a. Visual Observations

Visual observations did not indicate any serious structural problems with the embankment or appurtenant structures with the reservoir at its present level. The deficiencies which are described in Section 3, require immediate attention. Measures to improve these deficiencies are given in Section 7.

#### b. Design and Construction Data

No design computations or other data regarding the structural stability of the dam have been located.

On the basis of performance, visual inspection, as well as engineering judgement, the embankment and appurtenant structures appears to be adequate with the reservoir at its present level.

#### c. Operating Records

There are no operating records kept or available. There are no records or reports of any operational problems which would affect the stability of the dam.

#### d. Post-Construction Changes

It is reported that the dam was built sometime around 1900. There are no records of any construction changes that may have taken place prior to 1957. In 1957 Green Engineering Affiliates, Inc. Boston, Mass. undertook the design of the present intake tower, low level gate valve inlet, tunnel conduit and stilling basin. Details of the construction are not available.

#### e. Seismic Stability

The dam is located in Seismic Zone No. 2 and in accordance with recommended Phase I guidelines does not warrant seismic analyses.

## SECTION 7 - ASSESSMENT, RECOMMENDATIONS & REMEDIAL MEASURES

### 7.1 DAM ASSESSMENT

#### a. Safety

Phase I investigation of Van Horn Park Lower Dam does not indicate conditions which would constitute an immediate hazard to human life or property. Based on engineering judgment and the performance of the outlet works and earth embankment, the project is considered to be adequate under present conditions. The dam project, however, does have a number of deficiencies and unknown factors whose causes and circumstances are not sufficiently defined to assess the performance of the embankment under flood conditions. In addition, the assessable deficiencies, if not thoroughly remedied and monitored, have the potential for developing into hazardous conditions.

Because there are no data on Probable Maximum Floods for a drainage area of this size and condition, a design flood hydrograph was synthesized for the contributing area. The resulting inflow hydrograph has a peak discharge of 925 cfs and a runoff volume equivalent to 11.5 inches of which 9.8 inches enters the Lower Pond in 6 hours. Routing this flood through the reservoir using computerized techniques, resulted in a maximum discharge of 258 cfs with the pool rising to within 5 feet of the dam crest.

Since the dam is not expected to be overtopped with an inflow to the pond equal to one half the Probable Maximum Flood, it is considered that the spillway is adequate from a hydrologic and hydraulic standpoint.

#### b. Adequacy of Information

Information related to the outlet works has been found adequate for the Phase I investigation. However there are insufficient design data and performance records available to make an evaluation of the effects of the deficiencies noted in Section 3.1 on the performance of the embankment during flood conditions. In addition, there are unknown factors which can not reasonably be assumed for an evaluation of adequacy. Some of these factors are:

1. Properties and condition of foundation and embankment soils.
2. Zoning of embankment.
3. Condition of contact between the extrados of the steel plate lining of the conduit and the embankment material.
4. The potential effect deformation of the 72 inch outlet conduit on flow under high heads.
5. Effects of extensive root growth on seepage patterns within the embankment and foundation.
6. Record of previous pool elevations.

c. Urgency

Several of the observed deficiencies require short term corrective measures, others may be corrected as part of a regular maintenance program. A listing of the recommended improvements is given in the following paragraphs.

d. Necessity of Additional Investigations

Although the embankment is not in imminent danger under present conditions, additional investigations need to be undertaken by the owner within a short time to determine and evaluate the following: subsurface conditions, soil parameters, zoning of the embankment materials, nature of seepage conditions, and hydraulic capabilities of the conduit. These investigations should include, but not necessarily be limited to, subsurface exploration and testing, and piezometric observations.

A subsurface exploration program should be initiated consisting of borings and samples to identify foundation soils and embankment materials. Laboratory testing on disturbed and undisturbed samples should be performed to determine the parameters of the embankment and foundation materials.

A program of periodic diametral measurement of conduit lining, should be carried out by the use of simple measuring gauges between established points on the lining.

The seepage pattern through the embankment and foundation needs to be defined and may be accomplished by the installation of piezometers.

Hydraulic studies need to be carried out to determine the effect of high velocity flows through the deformed conduit and whether the adequacy of the dam will be effected.

The results of these investigations should then be utilized in stability and seepage analyses.

## 7.2 RECOMMENDATIONS

It is recommended that in the near future the owner take measures to correct the following deficiencies.

a. The possible seepage as described in Section 3.1 should be definitively determined and monitored.

b. The ruts and depressions on the slopes and crest should be back-filled to original grade with suitable compacted material. Strict measures should be taken to prevent the reoccurrence of the rutting formed by trail bikes.

c. The slope of the downstream toe should be flattened to the grade of the upper portion of the slope.

d. The debris in the stilling basin should be cleaned out, hauled away, and means taken to prevent its refilling.

e. The riprap at the downstream end of the stilling basin should be cleared and reinstalled.

f. Beyond the downstream end of the stilling basin, the ground surface should be regraded to allow surface runoff away from the basin.

g. Heavy bush, shrubs and young saplings should be removed from all locations on the embankment. Larger trees should not be removed but should be inventoried and their condition monitored. If a tree dies, the area around the tree should then be included in the inspection program for seepage.

### 7.3 REMEDIAL MEASURES

#### a. Alternatives

Not Applicable.

#### b. O & M Maintenance and Procedures

The results of the additional investigations recommended above in Section 7.1d may indicate remedial measures which will be needed to provide adequacy for the embankment under flood conditions. These measures can only be determined after the completion and evaluation of the additional investigations.

A formal program of operation, maintenance and inspection of the project should be established by the owner within the next twelve months.

The owner should establish a system with local officials for warning downstream residents in case of emergency. Round the clock surveillance should be provided by the owner during periods of unusually heavy precipitation.

## VISUAL INSPECTION CHECK LIST

## APPENDIX A

VISUAL INSPECTION CHECK LIST  
PARTY ORGANIZATION

PROJECT VANHORN PARK LOWER DAM

DATE 6/1/78

TIME 11.15 AM

WEATHER Sunny

W.S. ELEV. 146.5 U.S.

PARTY:

- |                             |           |
|-----------------------------|-----------|
| 1. <u>Harvey S Feldman</u>  | 6. _____  |
| 2. <u>Jyotindra H Patel</u> | 7. _____  |
| 3. _____                    | 8. _____  |
| 4. _____                    | 9. _____  |
| 5. _____                    | 10. _____ |

| PROJECT FEATURE                                                        | INSPECTED BY | REMARKS |
|------------------------------------------------------------------------|--------------|---------|
| 1. <u>Project features were inspected jointly by all party members</u> |              |         |
| 2. _____                                                               |              |         |
| 3. _____                                                               |              |         |
| 4. _____                                                               |              |         |
| 5. _____                                                               |              |         |
| 6. _____                                                               |              |         |
| 7. _____                                                               |              |         |
| 8. _____                                                               |              |         |
| 9. _____                                                               |              |         |
| 10. _____                                                              |              |         |

# PERIODIC INSPECTION CHECK LIST

PROJECT VANTORN PARK POND - LOWER DATE 6/1/78

PROJECT FEATURE \_\_\_\_\_ NAME \_\_\_\_\_

DISCIPLINE \_\_\_\_\_ NAME \_\_\_\_\_

~~DAM~~  
~~DAM~~ EMBANKMENT

Crest Elevation from drawings is 174.0 ±

Current Pool ~~Elevation~~ level is at bottom of profile. EL. 146.5 (from drawing)

Maximum Impoundment to Date \_\_\_\_\_

Surface Cracks None were observed because of heavy vegetation

Pavement Condition No pavement

Movement or Settlement of Crest None except for some ruts and other depressions caused by bike traffic

Lateral Movement None visible

Vertical Alignment Uniform with crest EL. 174 ± except as note above.

Horizontal Alignment No noticeable deformation

Condition at Abutment and at Concrete Structures Both abutments heavy vegetation.

Indications of Movement of Structural Items on Slopes 72" Ø outlet pipe through dam appears to be taking on an elliptical shape

Trespassing on Slopes Bikes trails and paths have caused depressions and ruts

Sloughing or Erosion of Slopes or Abutments Some erosion on both slopes; Sloughing cannot be discerned because of heavy vegetation.

Rock Slope Protection - Riprap Failures None

Unusual Movement or Cracking at or near Toes None were observed because of heavy vegetation.

Unusual Embankment or Downstream 100' ft south of stilling basin minor seepage at downstream toe but may be due to standing water as result of surface runoff.

Piping or Boils None Observed

Foundation Drainage Features None

Toe Drains None

Instrumentation System None

PERIODIC INSPECTION CHECK LIST

PROJECT VANHORN PARK POND LOWER

DATE 6/1/78

PROJECT FEATURE \_\_\_\_\_

NAME \_\_\_\_\_

DISCIPLINE \_\_\_\_\_

NAME \_\_\_\_\_

OUTLET WORKS - INTAKE CHANNEL AND  
INTAKE STRUCTURE

a. Approach Channel None

Slope Conditions \_\_\_\_\_

Bottom Conditions \_\_\_\_\_

Rock Slides or Falls \_\_\_\_\_

Log Boom \_\_\_\_\_

Debris \_\_\_\_\_

Condition of Concrete Lining \_\_\_\_\_

Drains or Weep Holes \_\_\_\_\_

b. Intake Structure

Condition of Concrete Generally in good condition.

Stop Logs and Slots None

Miscellaneous: Gate valve inlet submerged, therefore unable to determine if clogged; Orifice in the intake tower operating; Small amount of debris at trash rack at orifice; Intake at top of the tower is open. It is reported that water level never reached this level.

PERIODIC INSPECTION CHECK LIST

PROJECT VANHORN PARK LOWER DATE 6/1/78

PROJECT FEATURE \_\_\_\_\_ NAME \_\_\_\_\_

DISCIPLINE \_\_\_\_\_ NAME \_\_\_\_\_

OUTLET WORKS - TRANSITION AND CONDUIT

General Condition of Concrete General condition of the headwall at downstream side is good.

Rust or Staining of Concrete Minor rusting.

Spalling None observed.

Erosion or Cavitation \_\_\_\_\_

Cracking \_\_\_\_\_

Alignment of Monoliths 72"  $\phi$  Gunite lined conduit partially deformed at crown.

Alignment of Joints \_\_\_\_\_

Numbering of Monoliths \_\_\_\_\_

# PERIODIC INSPECTION CHECK LIST

PROJECT VAN HORN PARK LOWER DATE 6/1/78

PROJECT FEATURE \_\_\_\_\_ NAME \_\_\_\_\_

DISCIPLINE \_\_\_\_\_ NAME \_\_\_\_\_

## OUTLET WORKS - OUTLET STRUCTURE AND

OUTLET CHANNEL STILLING BASIN

General Condition of Concrete Generally in fair condition

Rust or Staining Some rust and staining observed

Spalling Minor spalling of the basin floor.

Erosion or Cavitation Minor erosion

Visible Reinforcing None visible

Any Seepage or Efflorescence No seepage; Some algae growth on wall under brooks inlet.

Condition at Joints \_\_\_\_\_

Drain Holes Visible drain holes show no evidence of water. Other drain holes are covered by debris.

Channel 48"  $\phi$  RCP Sewer main entrance blocked by heavy debris.

Loose Rock or Trees Overhanging Channel None

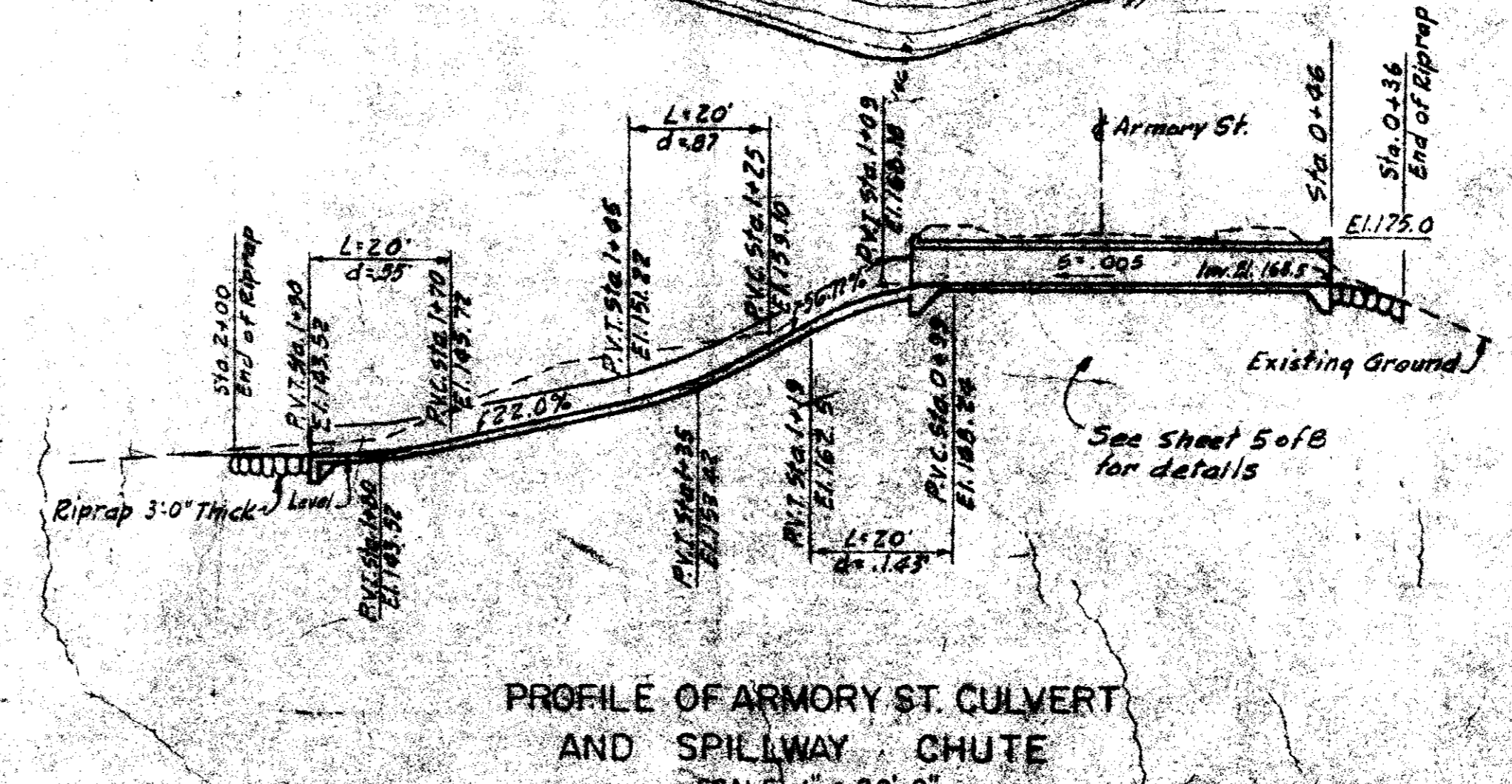
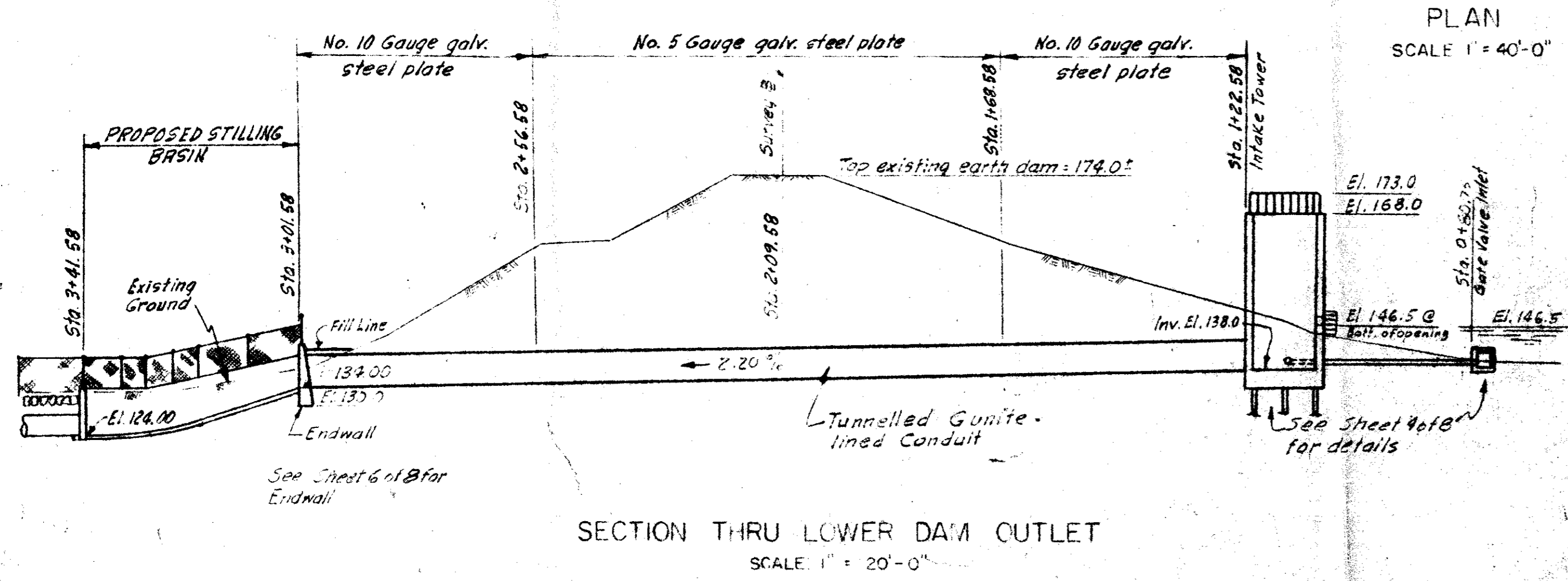
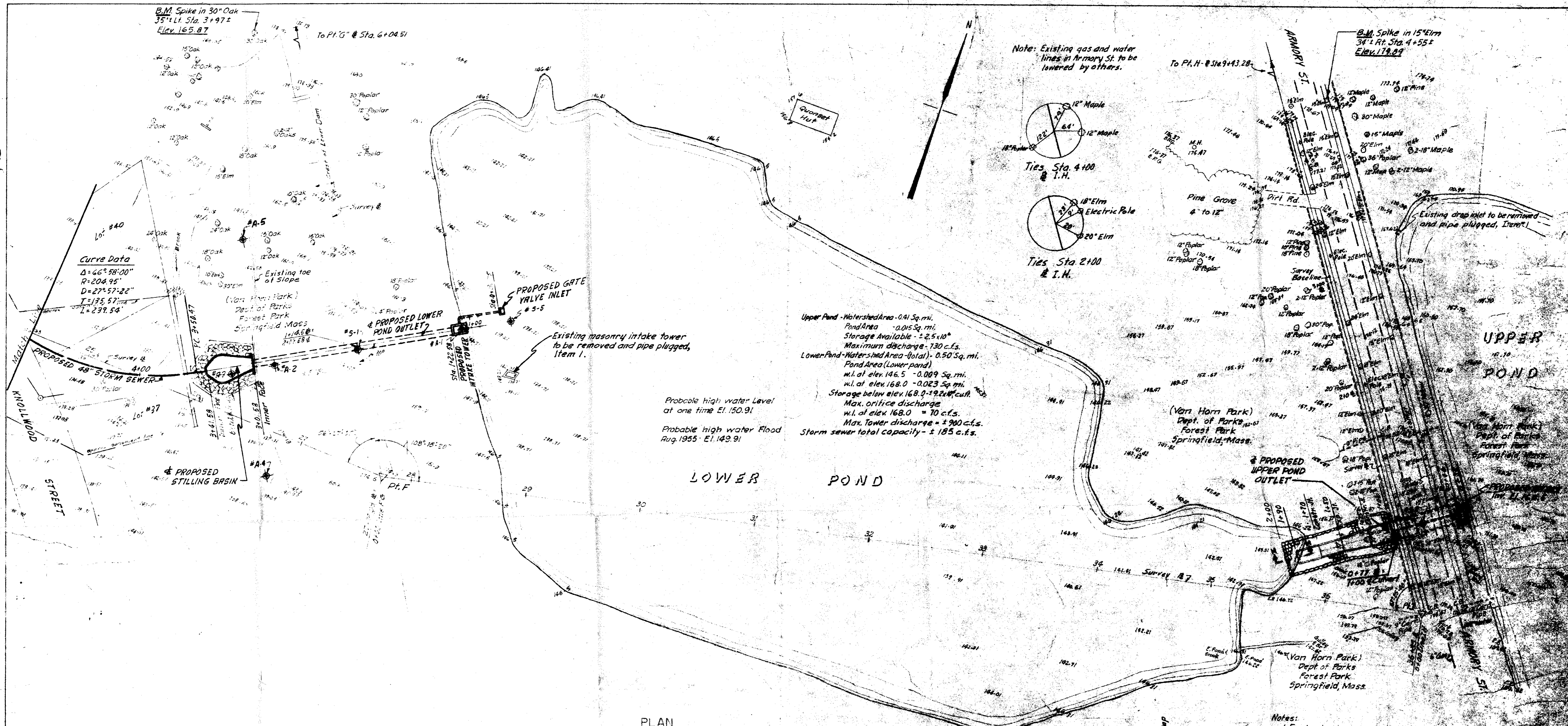
Condition of Discharge Channel None

MISCELLANEOUS Riprap on sides and lower end of stilling basin covered by sand and vegetation. Lower portion of riprap covering 48"  $\phi$  outlet pipe has settled some 3 feet.

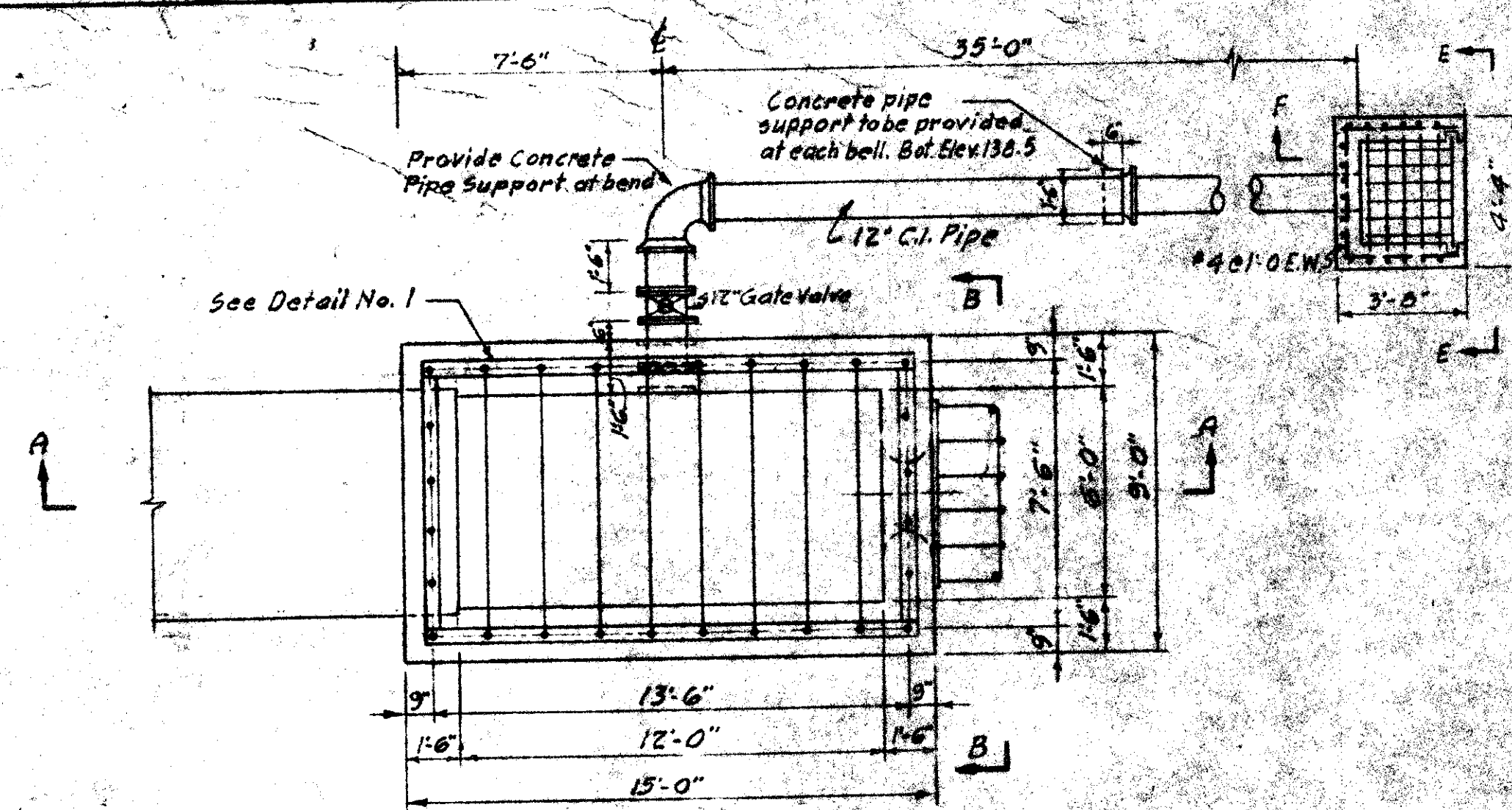
Stilling basin fence non-existent.

## DRAWINGS AND INSPECTION REPORTS

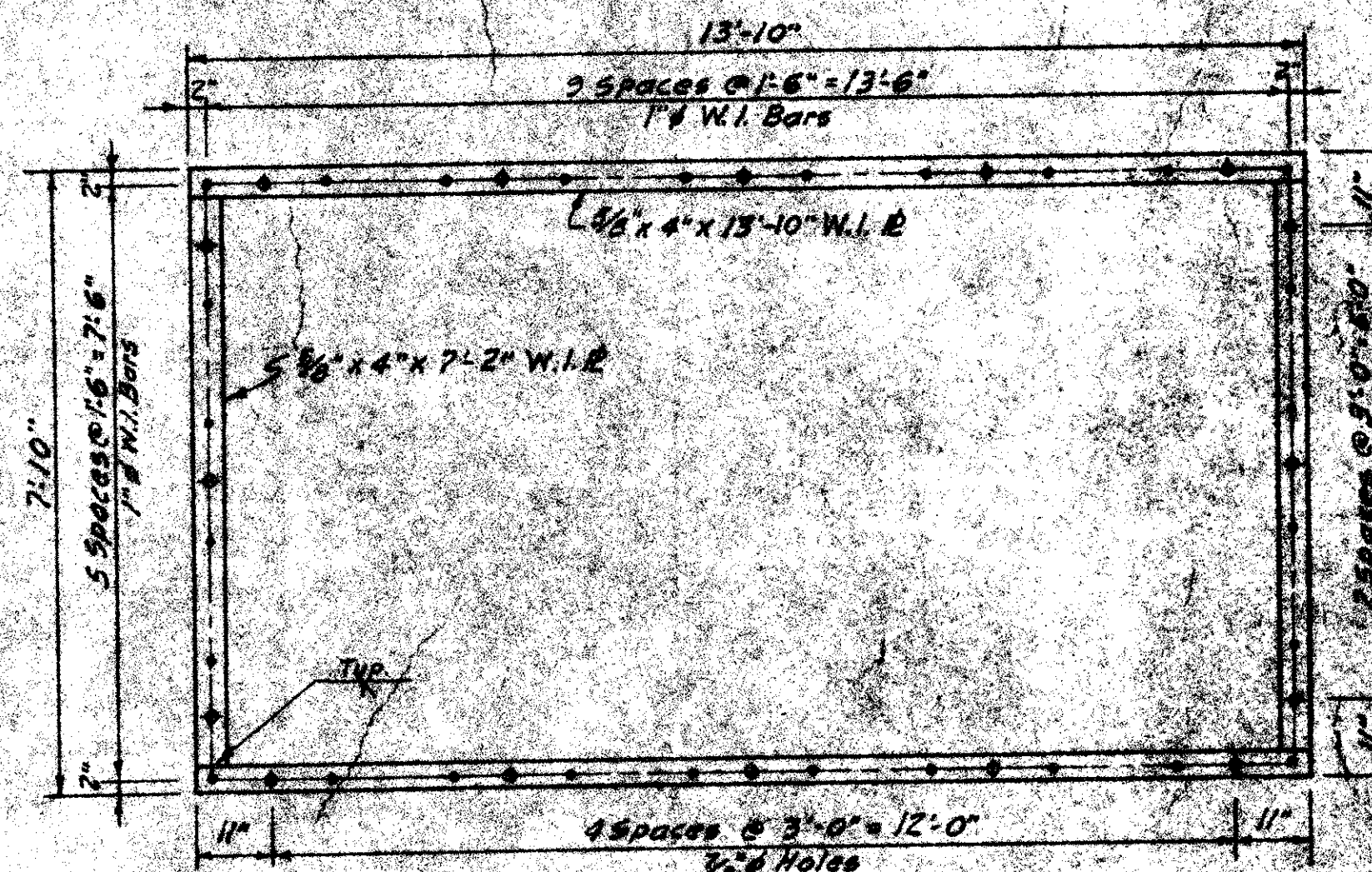
## APPENDIX B



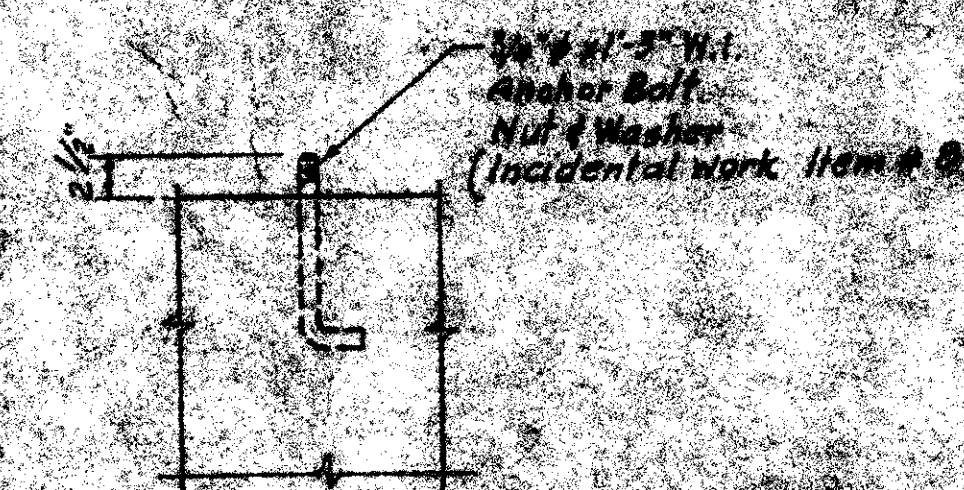
|                                                                                                                                                                         |                                                           |                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|----------------------------------------------------------------|
| <b>PROPOSED OUTLET WORKS</b><br><b>VAN HORN PARK</b><br><b>SPRINGFIELD, MASS.</b><br><b>DEPARTMENT OF PUBLIC WORKS OF MASSACHUSETTS</b><br><b>DIVISION OF WATERWAYS</b> |                                                           |                                                                |
| <b>PLAN AND DETAILS</b>                                                                                                                                                 |                                                           |                                                                |
| <b>GREEN ENGINEERING AFFILIATES, INC.</b><br><b>ENGINEERS</b><br><b>BOSTON</b>                                                                                          |                                                           |                                                                |
| DESIGNED: D.C.<br>DRAWN: J.A.M.<br>CHECKED: J.R.H.                                                                                                                      | SCALE: AS SHOWN<br>DATE: MARCH, 1957<br>CONTRACT NO. 1743 | SHEET NO.<br>3 OF 8<br>CHIEF WATERWAYS ENGINEER<br>ACC. 0244MC |



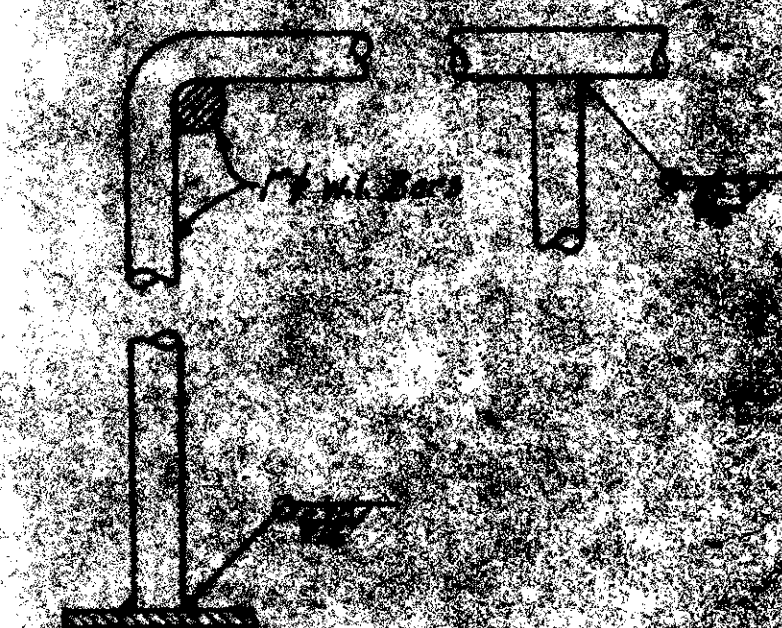
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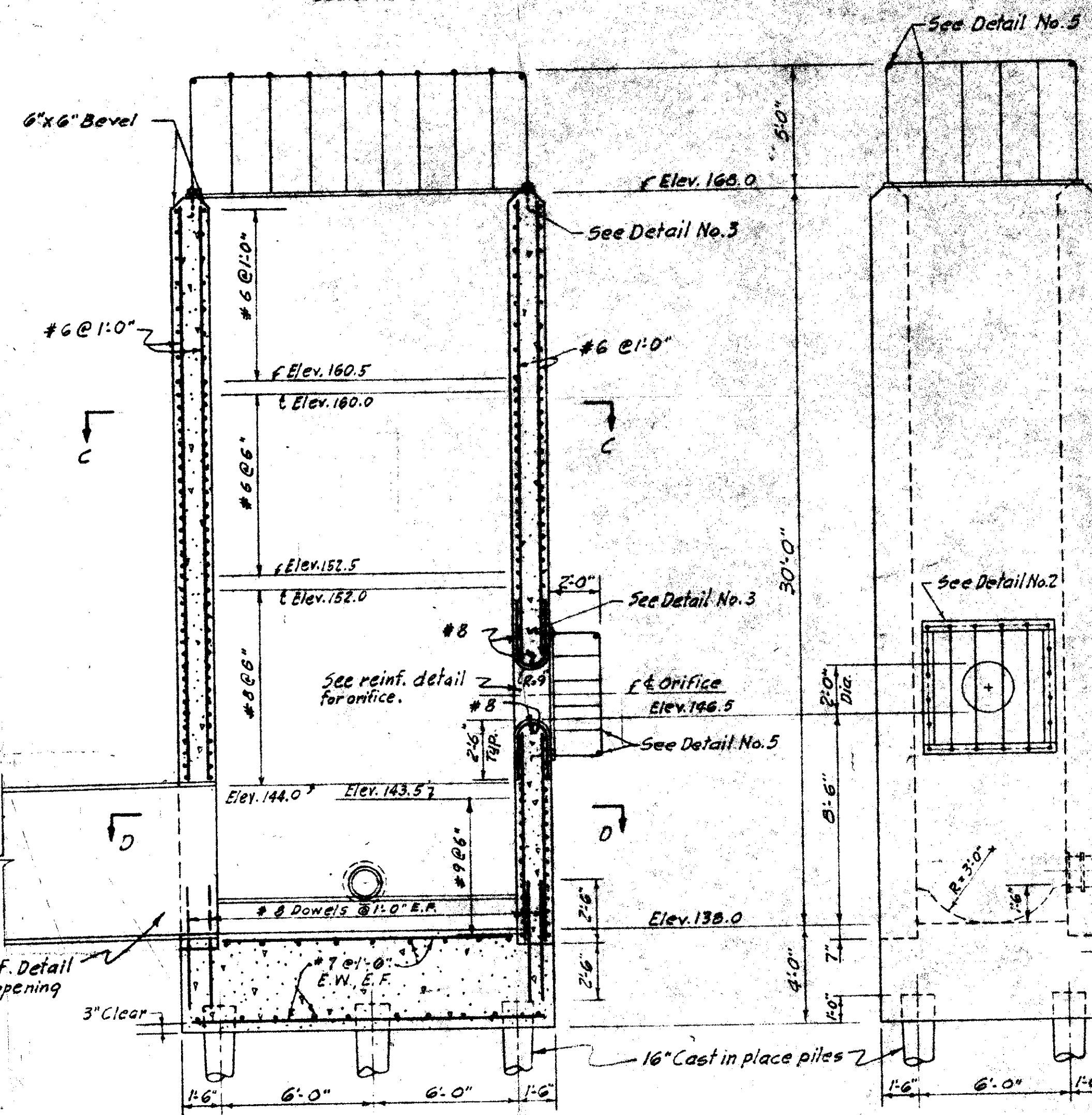
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DETAIL No. 3  
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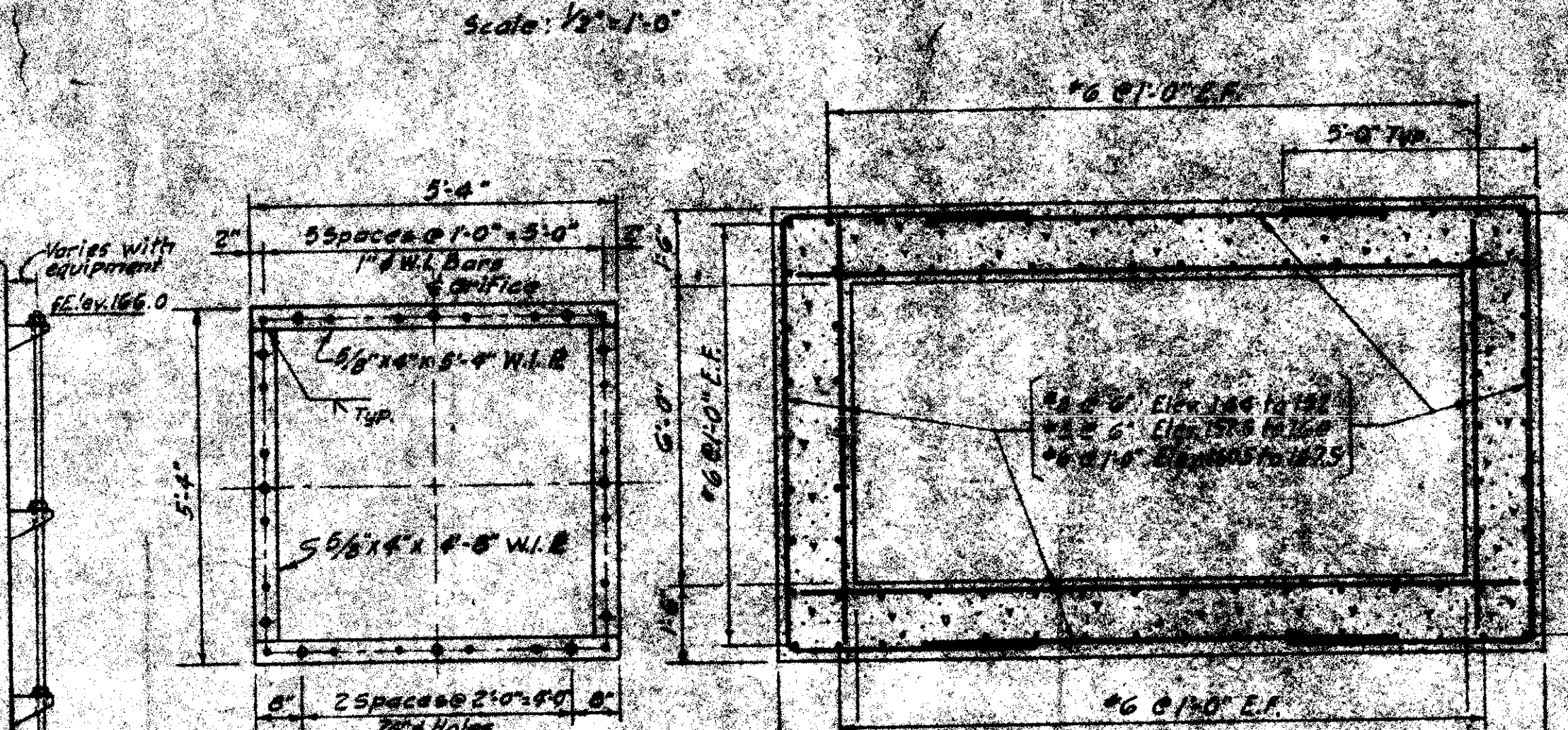
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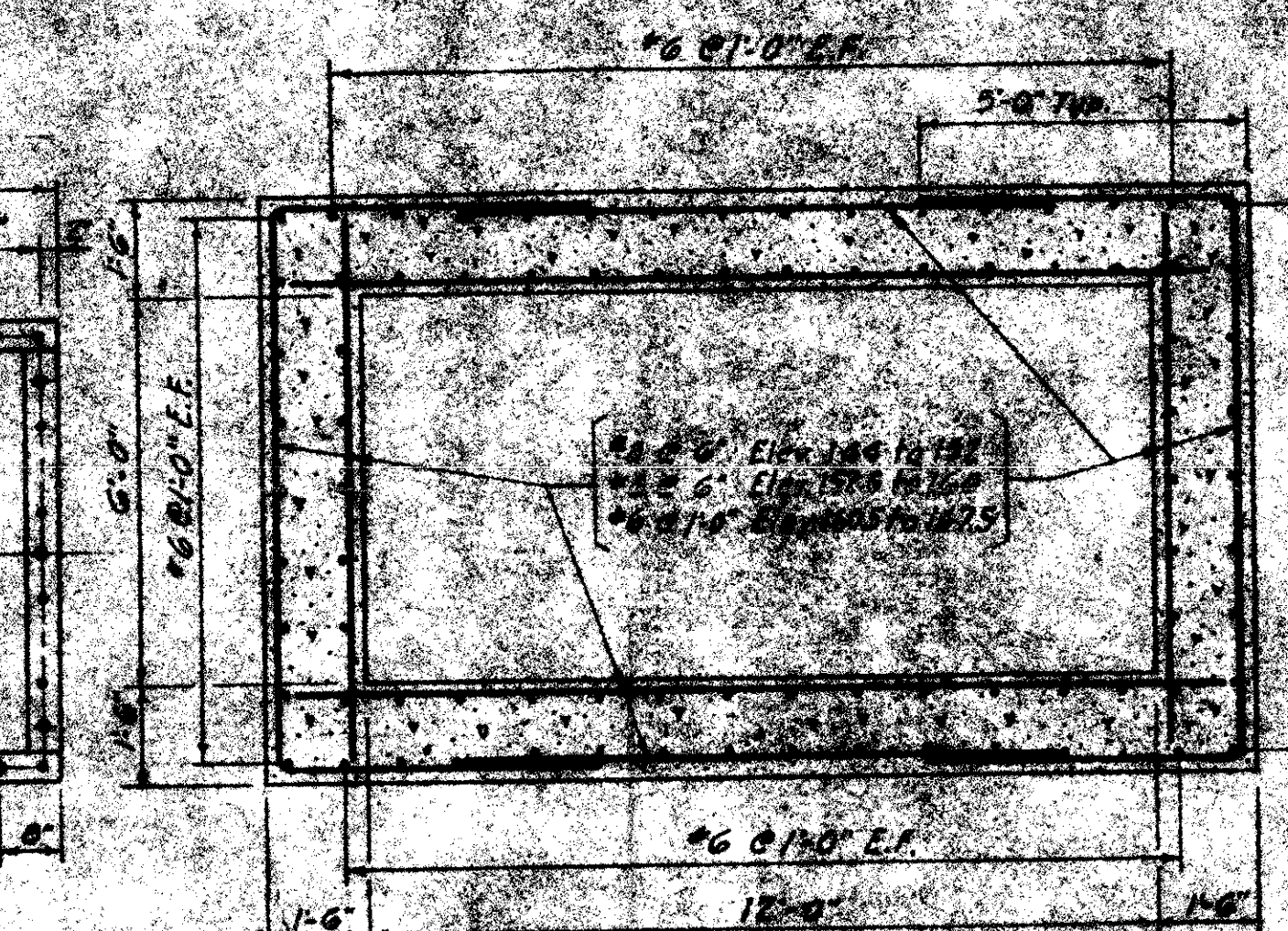
SECTION A-A

INTAKE TOWER  
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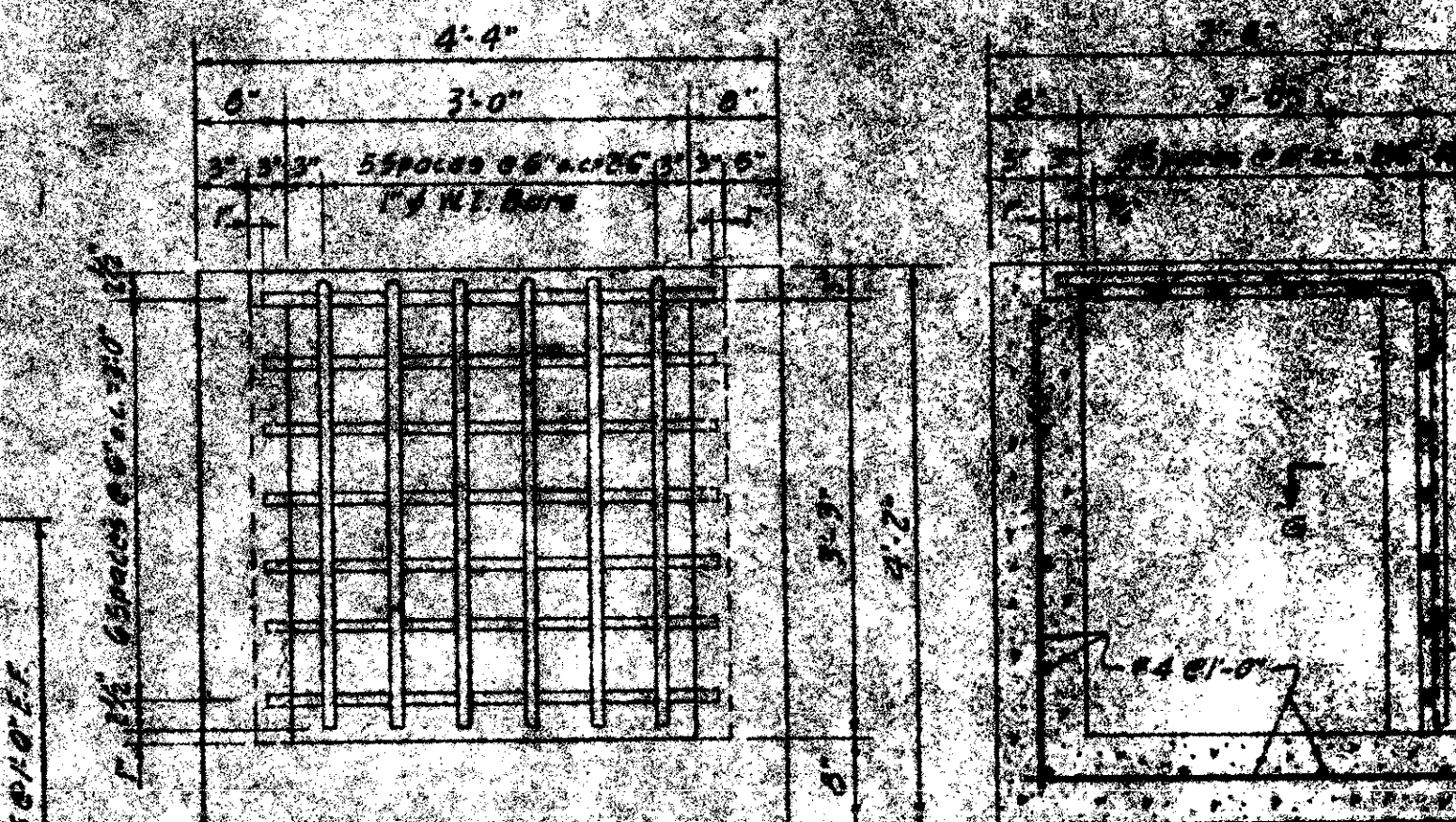
ELEVATION B-B



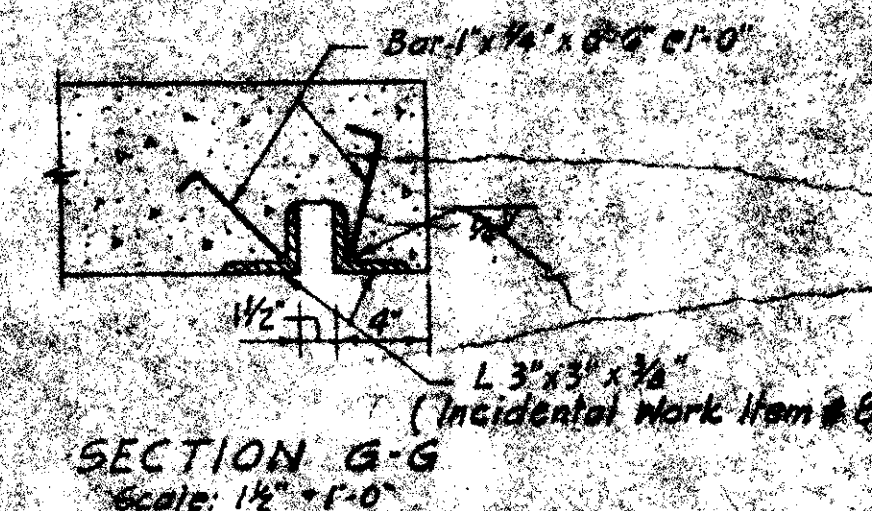
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SECTION C-C  
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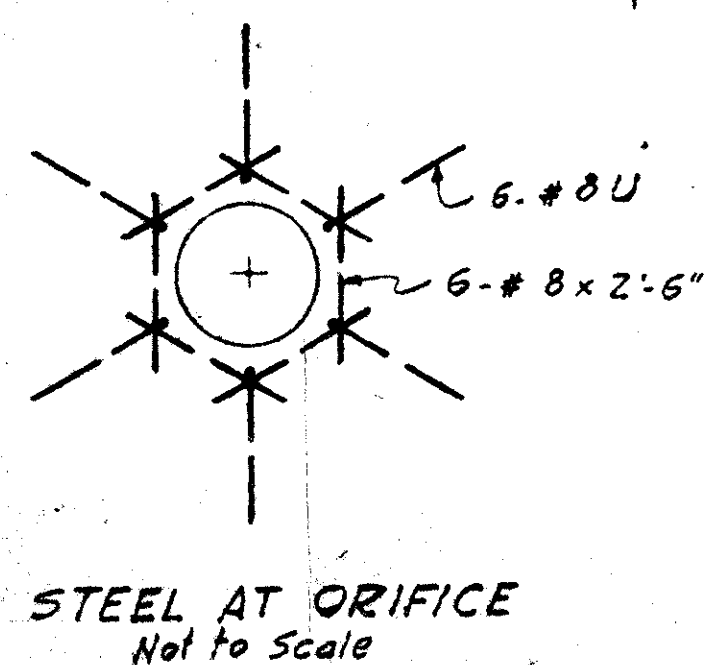


ELEVATION E-E  
GATE VALVE INLET STRUCTURE STA. 0+89.75  
Scale: 1/4" = 1'-0"

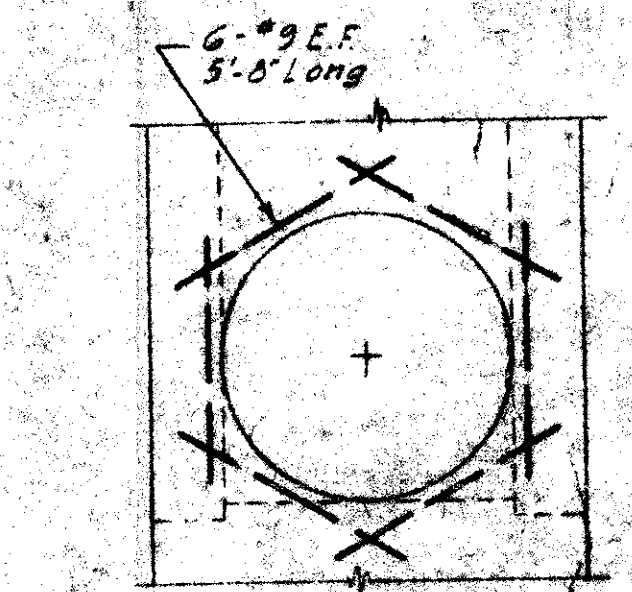


SECTION D-D  
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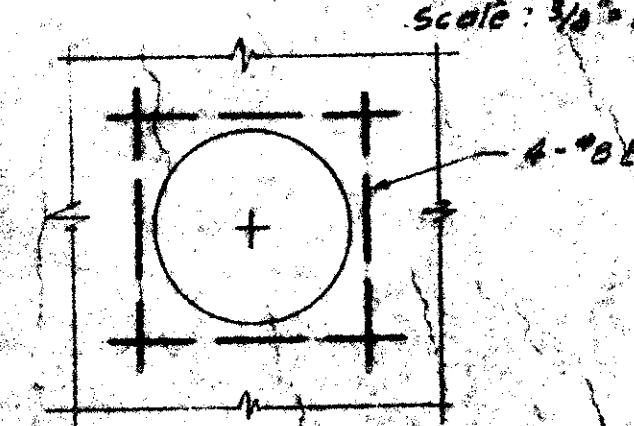
Note: For General Notes see Sheet No. 5 of 8



STEEL AT ORIFICE  
Not to Scale

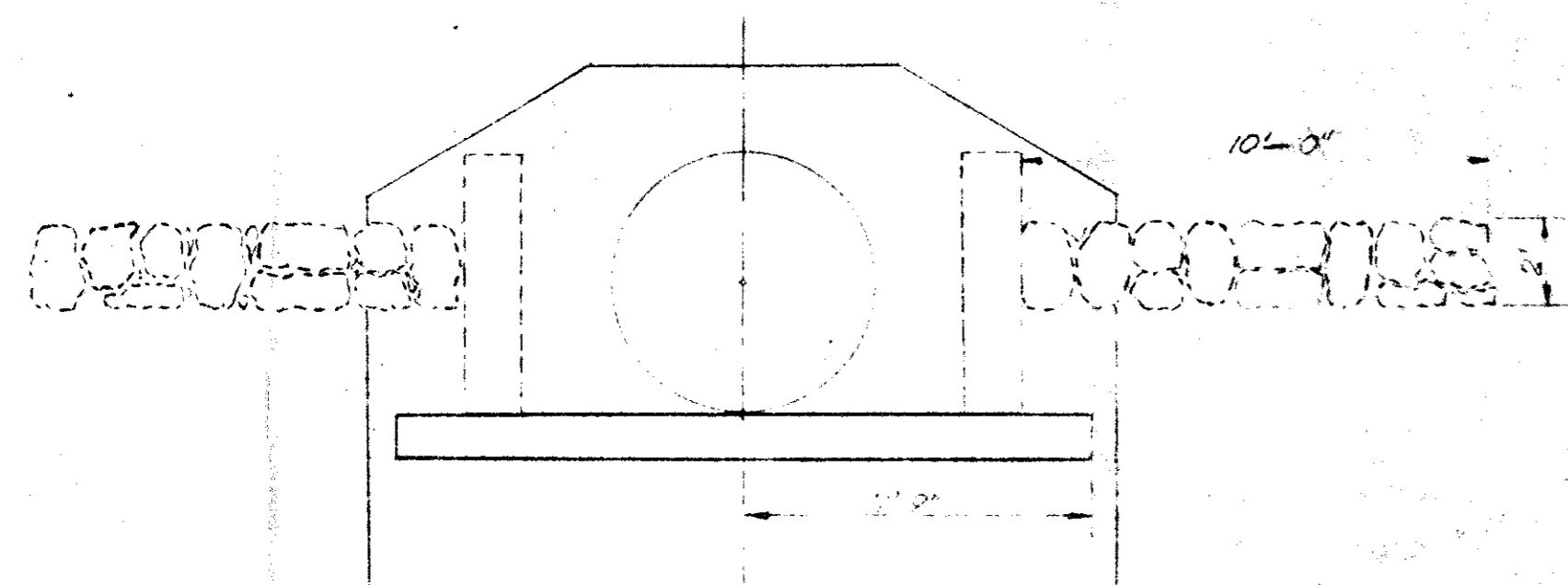
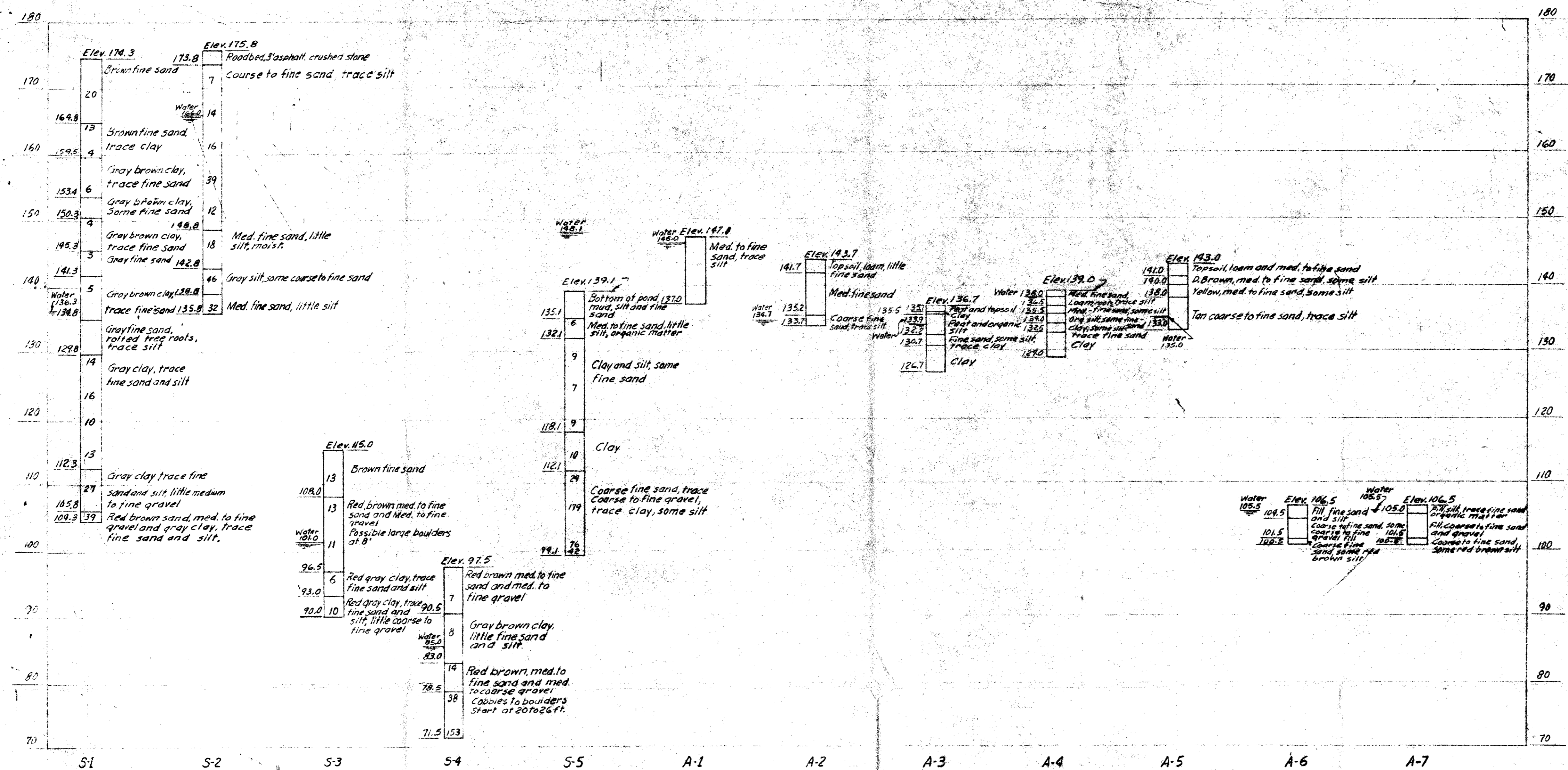


STEEL AT OUTLET PIPE OPENING  
Not to Scale



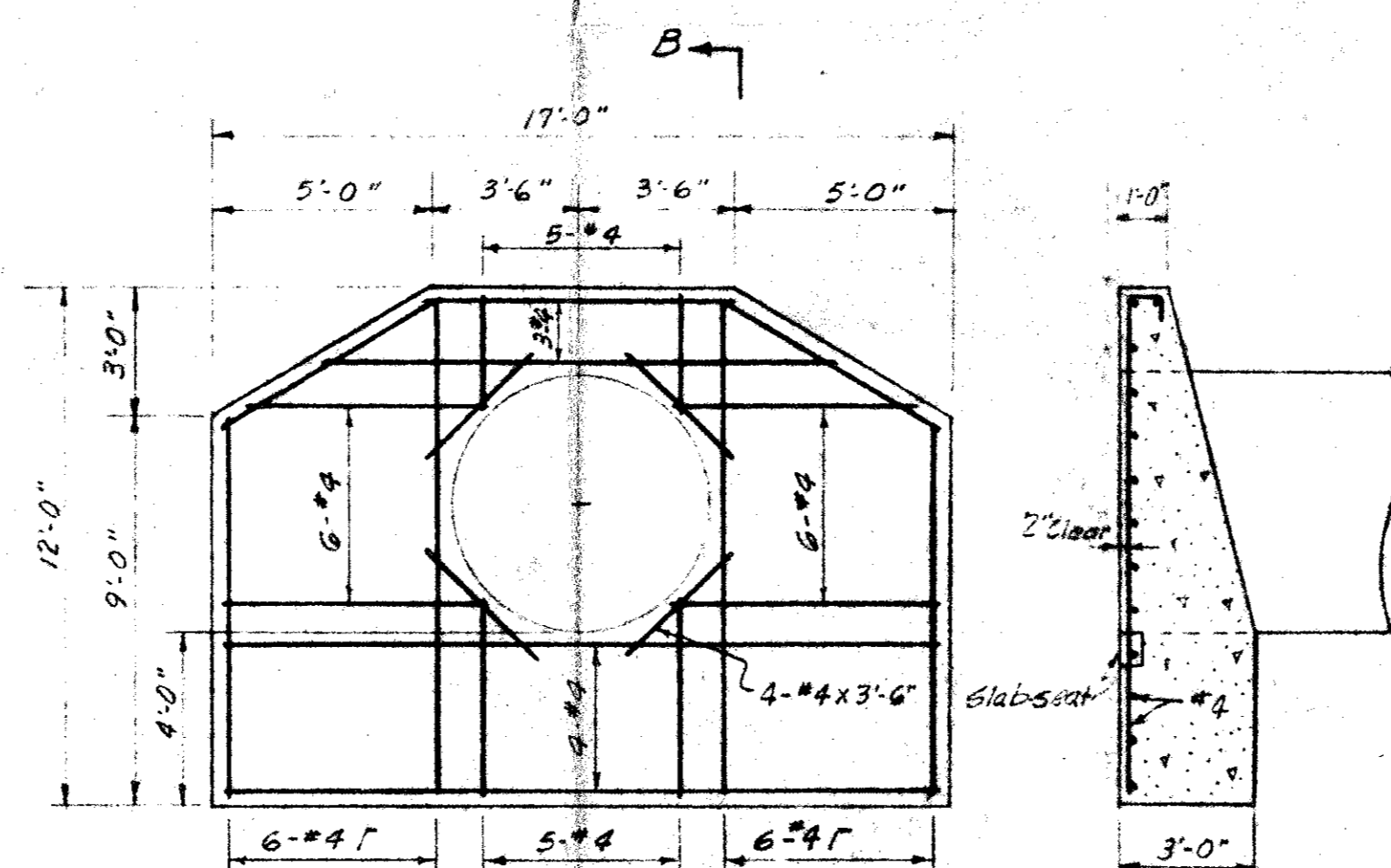
STEEL AT 12" GATE VALVE  
OPENING  
Not to Scale

|                                                                                                                                                 |                                                                   |                                                                             |                             |
|-------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------|
| <p>PROPOSED OUTLET WORKS<br/>VAN HORN PARK<br/>SPRINGFIELD, MASS.<br/>DEPARTMENT OF PUBLIC WORKS OF MASSACHUSETTS<br/>DIVISION OF WATERWAYS</p> |                                                                   |                                                                             |                             |
| <p>LOWER POND OUTLET<br/>INTAKE TOWER</p>                                                                                                       |                                                                   |                                                                             | <p>SHEET NO.<br/>4 OF 8</p> |
| <p>GREEN ENGINEERING AFFILIATES, INC.<br/>ENGINEERS<br/>BOSTON</p>                                                                              |                                                                   |                                                                             |                             |
| <p>DESIGNED BY<br/>DRAWN BY<br/>CHECKED BY</p>                                                                                                  | <p>SCALE AS SHOWN<br/>DATE: MARCH, 1957<br/>CONTRACT NO. 1743</p> | <p><i>Robert A. Hall</i><br/>CHIEF WATERWAYS ENGINEER<br/>A.C.C. 035533</p> |                             |



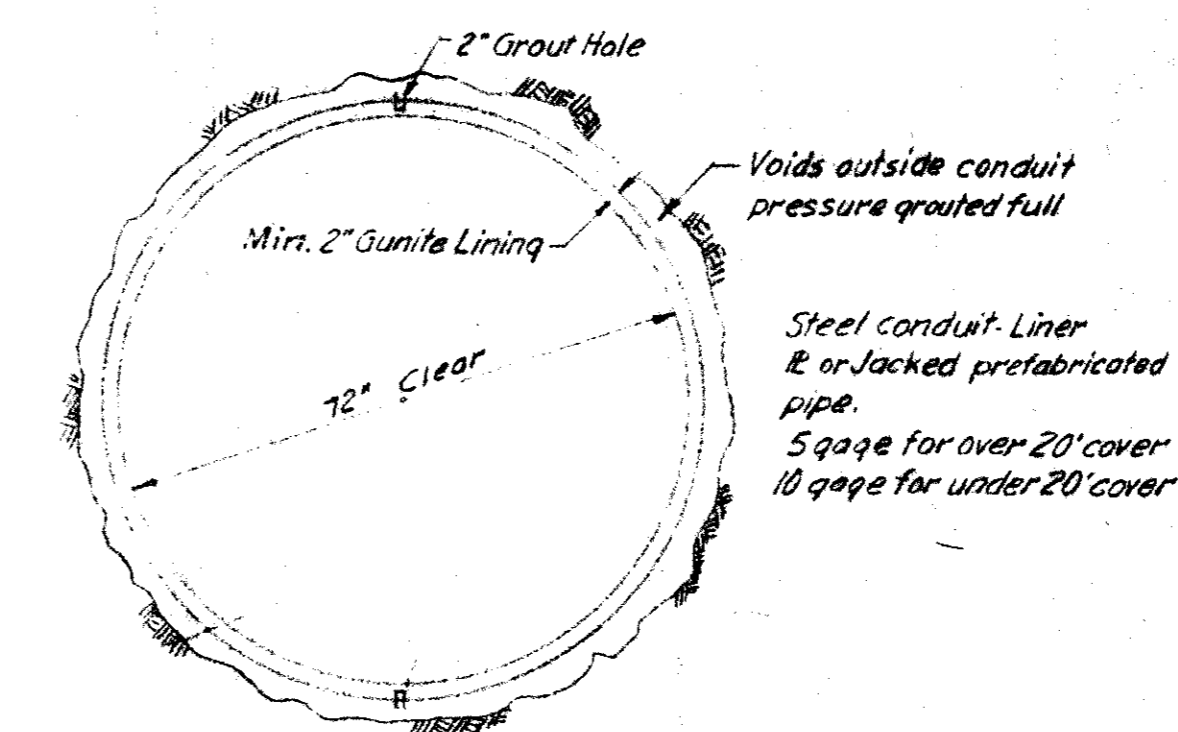
ELEVATION-SHOWING RIPRAP

ENDWALL AT STA. 3+01.58  
Scale: 1/4" = 1'-0"



ELEVATION-SHOWING REINFORCING

SECTION B-B  
Scale: 1/4" = 1'-0"



TYPICAL SECTION  
Lower Pond Outlet Conduit in Tunnelled Section  
Scale: 1/2" = 1'-0"

Note  
For General Notes see sheet No. 5 of 8

PROPOSED OUTLET WORKS  
VAN HORN PARK  
SPRINGFIELD, MASS.  
DEPARTMENT OF PUBLIC WORKS OF MASSACHUSETTS  
DIVISION OF WATERWAYS

BORINGS &  
MISCELLANEOUS DETAILS

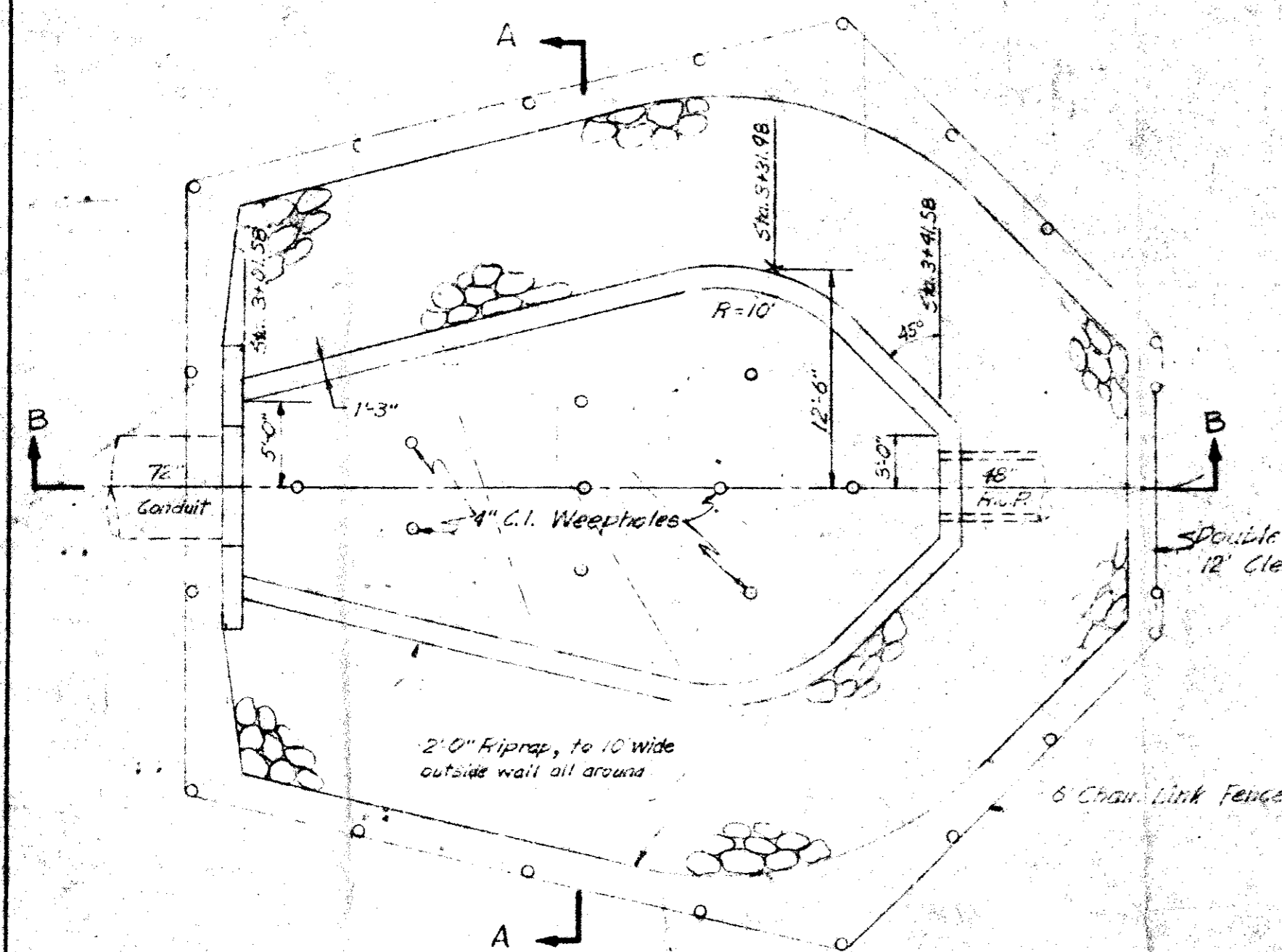
SHEET NO.  
6 OF 8

GREEN ENGINEERING AFFILIATES, INC.  
ENGINEERS  
BOSTON

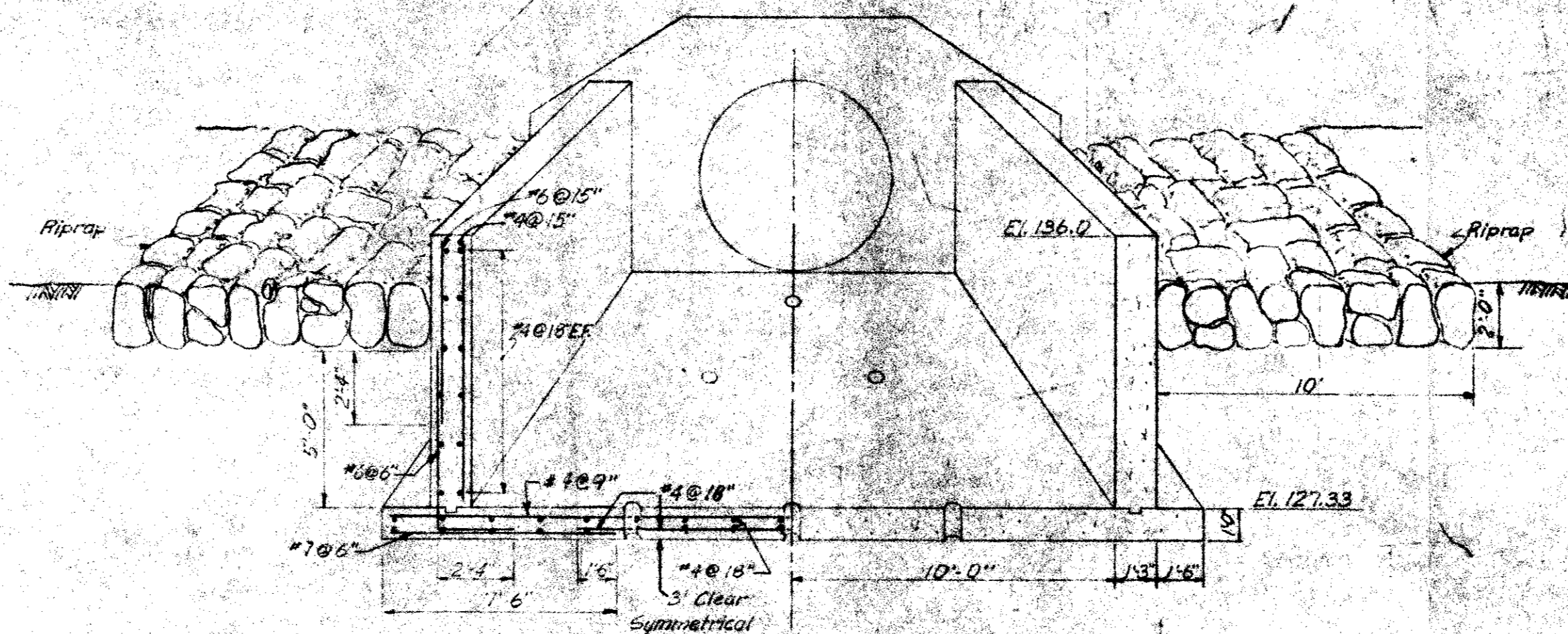
DESIGNED: R.E.  
DRAWN: E.L.S.  
CHECKED: R.D.M.

SCALE: AS SHOWN  
DATE: MARCH, 1957  
CONTRACT NO. 1743

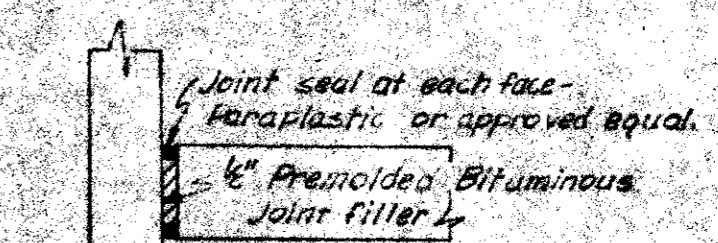
Robert B. Macomber  
CHIEF WATERWAYS ENGINEER  
ACC. 03684F



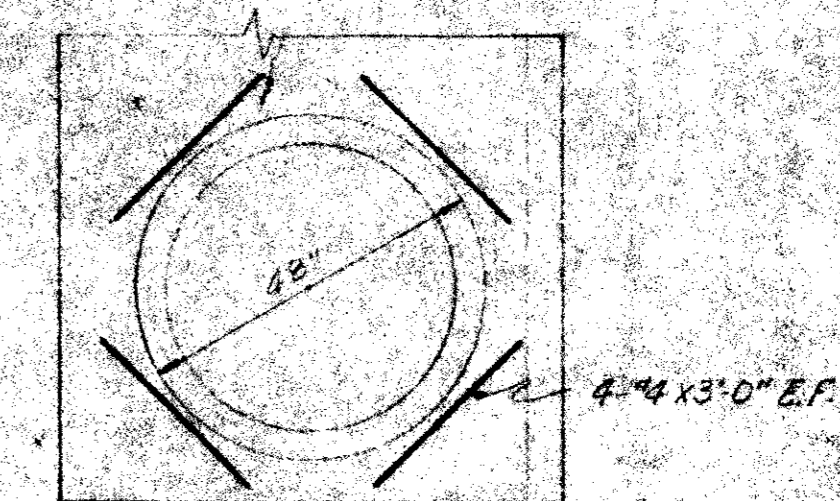
PLAN  
STILLING BASIN  
Scale:  $\frac{1}{8}$ " = 1'-0"



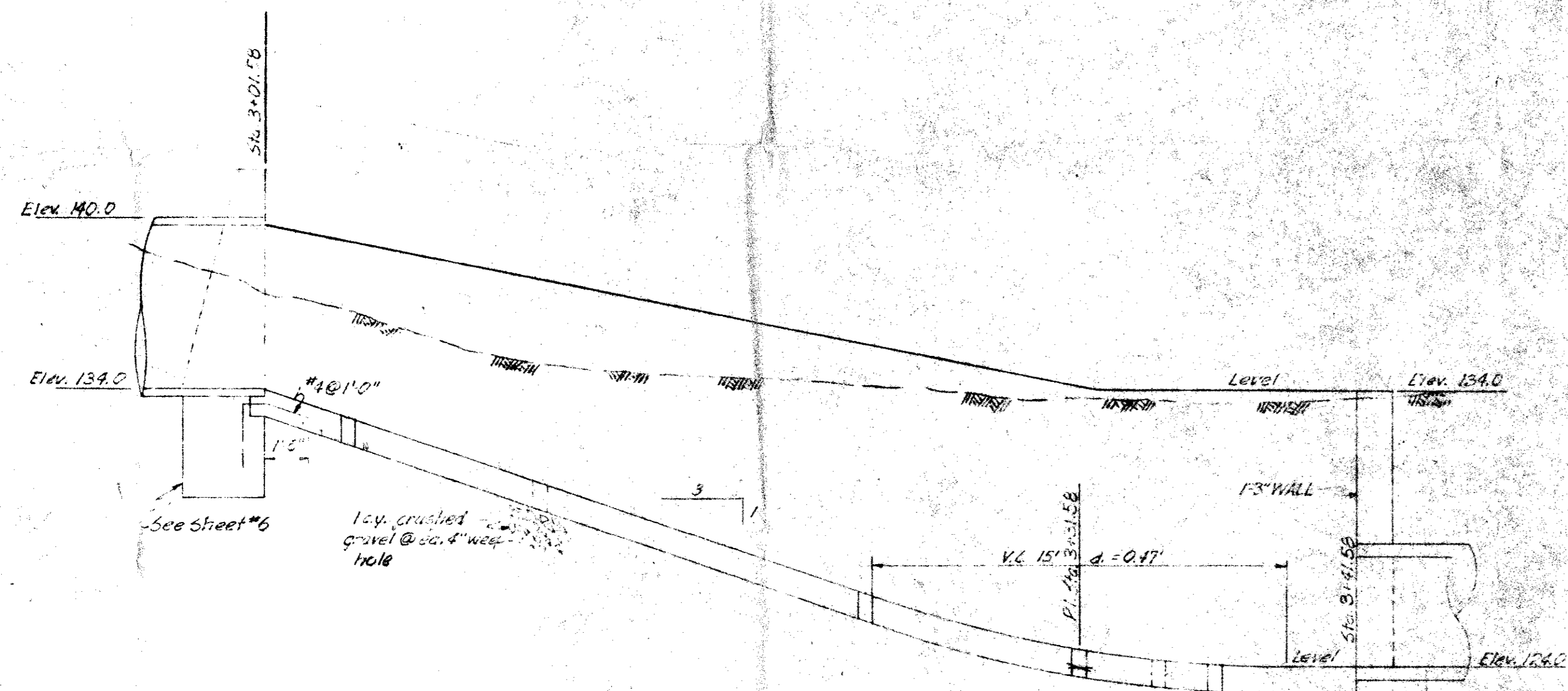
SECTION A-A  
(Typical)  
Scale:  $\frac{1}{4}$ " = 1'-0"



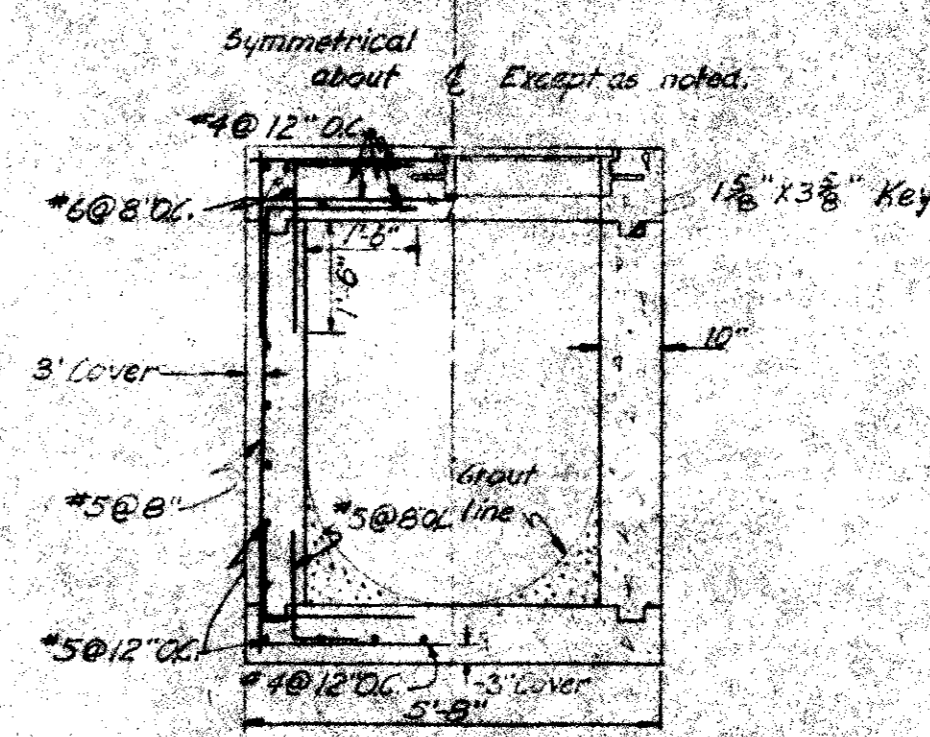
DETAIL OF JOINT  
Stilling Basin Wall at Conduit Endwall  
Not to Scale



Detail of Reinforcing at 48" Pipe  
Scale:  $\frac{1}{8}$ " = 1'-0"

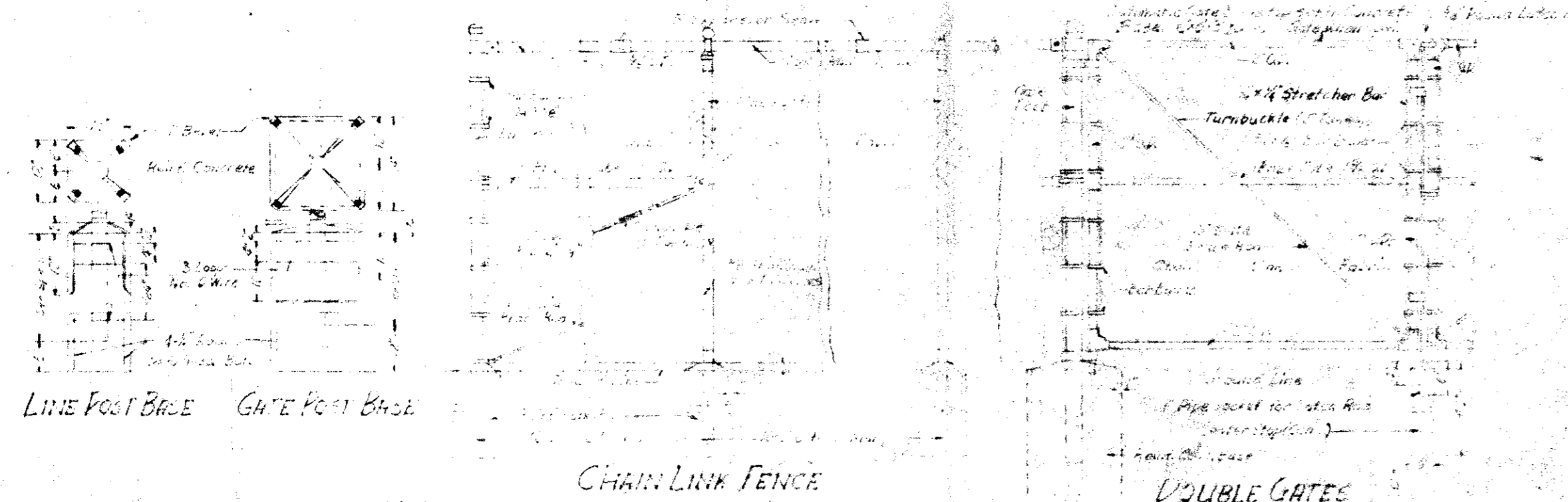


PLAN  
M.H. AT STA. 16+00  
Scale:  $\frac{1}{8}$ " = 1'-0"



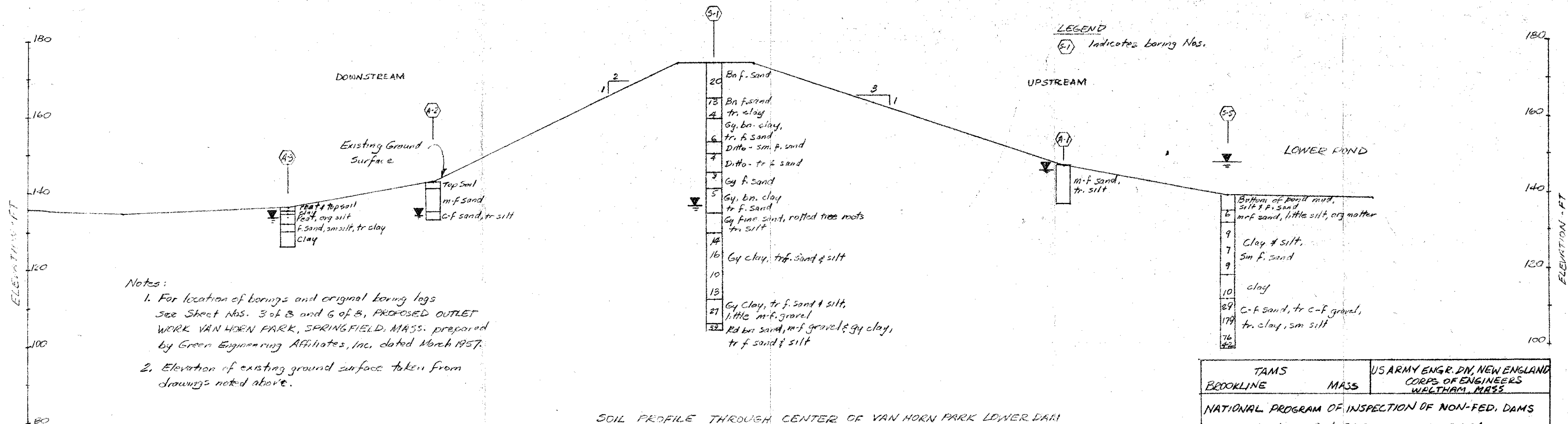
SECTION M-M  
Scale:  $\frac{1}{8}$ " = 1'-0"

- Notes:
1. See Sheet 3 for plan and profiles.
  2. See Sheet 6 for Conduit Endwall details.
  3. See Sheet 7 for Manhole cover details.
  4. All steel to have 2" of concrete cover except as noted.
  5. For General Notes see Sheet No. 5410.



- Notes:
1. Fence to be 6'-0" high.
  2. Gate to have 12'-0" clear opening.

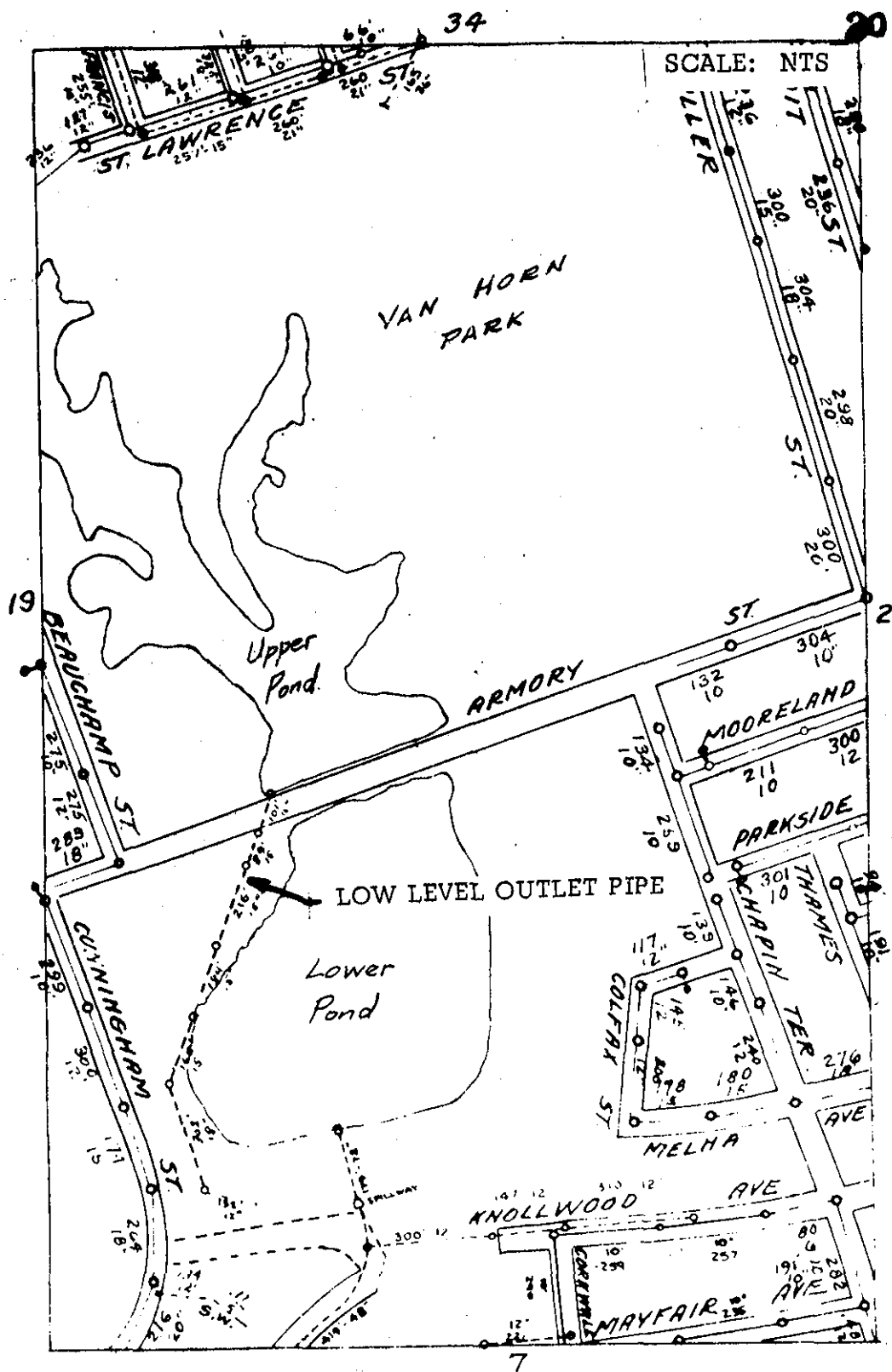
|                                                                                                                                                                                                       |                                                                                      |                                                                                   |                                            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------------------|
| <p align="center"><b>PROPOSED OUTLET WORKS</b><br/> <b>VAN HORN PARK</b><br/> <b>SPRINGFIELD, MASS.</b><br/> <b>DEPARTMENT OF PUBLIC WORKS OF MASSACHUSETTS</b><br/> <b>DIVISION OF WATERWAYS</b></p> |                                                                                      |                                                                                   |                                            |
| <p align="center"><b>STILLING BASIN AND MANHOLE DETAILS</b></p>                                                                                                                                       |                                                                                      |                                                                                   | <p align="center">SHEET NO.<br/>8 OF 8</p> |
| <p align="center"><b>GREEN ENGINEERING AFFILIATES, INC.</b><br/> <b>ENGINEERS</b><br/> <b>BOSTON</b></p>                                                                                              |                                                                                      |                                                                                   |                                            |
| <p>DESIGNED: CAG<br/>         DRAWN: S. L.<br/>         CHECKED: H. H.</p>                                                                                                                            | <p>SCALE: AS SHOWN<br/>         DATE: MARCH, 1957<br/>         CONTRACT NO. 1743</p> | <p align="right"> <br/> <b>CHIEF ENGINEER</b><br/>         ACC. 03894H       </p> |                                            |



- Notes:
1. For location of borings and original boring logs see Sheet Nos. 3 of B and 6 of B, PROPOSED OUTLET WORK VAN HORN PARK, SPRINGFIELD, MASS. prepared by Green Engineering Associates, Inc. dated March 1957.
  2. Elevation of existing ground surface taken from drawings noted above.

SOIL PROFILE THROUGH CENTER OF VAN HORN PARK LOWER DAM  
 Scale: 1:20

|                                                                            |  |                                                                      |  |
|----------------------------------------------------------------------------|--|----------------------------------------------------------------------|--|
| TAMS<br>BROOKLINE MASS                                                     |  | US ARMY ENGR. DM. NEW ENGLAND<br>CORPS OF ENGINEERS<br>WALTHAM, MASS |  |
| NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS<br>VAN HORN PARK LOWER DAM |  |                                                                      |  |
| SOILS PROFILE                                                              |  |                                                                      |  |
| CONNECTICUT RIVER BASIN                                                    |  | MASS                                                                 |  |
|                                                                            |  | SCALE: NTS                                                           |  |
|                                                                            |  | DATE: JULY 78                                                        |  |



SEWER AND LOW LEVEL OUTLET PLAN  
VAN HORN PARK UPPER DAM



# The Commonwealth of Massachusetts

EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS  
DEPARTMENT OF ENVIRONMENTAL QUALITY ENGR.  
DIVISION OF WATERWAYS

100 Nashua Street, Boston 02114

November 8, 1976

Park Commissioners  
City of Springfield  
Forest Park Office  
Springfield, Massachusetts

RE: Inspection Dam #2-7-281-10  
Van Horn Park - Lower Dam  
Springfield

Gentlemen:

On March 22, 1976, an Engineer from the Massachusetts Department of Public Works made a visual inspection of the above dam. Our records indicate the owner to be the City of Springfield. If this information is incorrect, will you please notify this office.

The inspection was made in accordance with the provisions of Chapter 253 of the Massachusetts General Laws as amended (Dams Safety Act). Chapter 706 of the Acts of 1975 transferred the jurisdiction of the so-called "Dams Safety Program" to the Commissioner of the Department of Environmental Quality Engineering.

The results of the inspection indicate that this dam is conditionally safe. The following conditions were noted that require attention:

Attached is a copy of remarks and recommendations from an inspection report submitted by Mr. Harold T. Shumway, District Dams Engineer. Please note Mr. Shumway's evaluation of your maintenance program. Immediate steps should be taken to correct all deficiencies.

We call these conditions to your attention before they become serious and more expensive to correct. With any correspondence please include the number of the dam as indicated above.

Very truly yours,

John T. Hannon, F.E.  
Chief Engineer

cc: Hon. Wm. C. Sullivan  
F.J. Hoey  
H.T. Shumway

MAY 17 1978

Enclosure

# INSPECTION REPORT - DAMS AND RESERVOIRS

## 1. LOCATION:

City/~~County~~ Springfield . County Hampden . Dam No. 2-7-281-10 .

Name of Dam Van Horn Park - Lower Dam .

Mass. Rect.

Topo Sheet No. 12 D . Coordinates: N 411,700 , E 302,200 .

Inspected by: Harold T. Shumway , On March 22, 1976 . Date 4-22-74 . Last Inspection

## 2. OWNER/S: As of March 22, 1976

per: Assessors \_\_\_\_\_, Reg. of Deeds \_\_\_\_\_, Prev. Insp. X , Per. Contact \_\_\_\_\_.

City of Springfield

1. Park Commissioners, Park Department, Forest Park Office, Springfield, Mass.

| Name | St. & No. | City/Town | State | Tel. No. |
|------|-----------|-----------|-------|----------|
|      |           |           |       |          |
|      |           |           |       |          |
|      |           |           |       |          |
|      |           |           |       |          |

2. \_\_\_\_\_

| Name | St. & No. | City/Town | State | Tel. No. |
|------|-----------|-----------|-------|----------|
|      |           |           |       |          |
|      |           |           |       |          |
|      |           |           |       |          |
|      |           |           |       |          |

3. \_\_\_\_\_

| Name | St. & No. | City/Town | State | Tel. No. |
|------|-----------|-----------|-------|----------|
|      |           |           |       |          |
|      |           |           |       |          |
|      |           |           |       |          |
|      |           |           |       |          |

## 3. CARETAKER: (if any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

Mr. Albert Poehler

Deputy Supt. for Maintenance, Park Department, Forest Park Office, Springfield, Mass.

| Name | St. & No. | City/Town | State | Tel. No. |
|------|-----------|-----------|-------|----------|
|      |           |           |       |          |
|      |           |           |       |          |
|      |           |           |       |          |
|      |           |           |       |          |

## 4. DATA:

No. of Pictures Taken None . Sketches See description of Dam.  
Plans, Where At Division of Waterways, Boston. Plans for Contract  
No. 1743, dated March, 1957, ACC 03684A.

## 5. DEGREE OF HAZARD: (if dam should fail completely)\*

|                    |                               |
|--------------------|-------------------------------|
| 1. Minor _____.    | 3. Severe _____.              |
| 2. Moderate _____. | 4. Disastrous <u>X</u> _____. |

Comments: Approximately 10 million gallons impoundment - dense population and development area downstream.

\*This rating may change as land use changes (future development).

6. OUTLETS: OUTLET CONTROLS AND DRAWDOWN  
 Approximately center of dam - 72" diameter steel conduit  
 No. 1 Location and Type: from intake tower to stilling basin  
 Intake tower has a 2' diameter orifice 8½' above flow line  
 Controls Yes, TYPE: of conduit and 21½' below open top of tower.  
 Automatic X. Manual \_\_\_\_\_. Operative Yes X, No \_\_\_\_\_.  
 Comments: Some driftwood and debris noted around 2' orifice trash rack  
2' above 72" conduit - 12" diameter pipe enters intake tower.  
 No. 2 Location and Type: 12" pipe from bottom of pond to intake tower - 35' away.  
 Controls Yes, Type: 12" non-rising stem gate valve  
 Automatic \_\_\_\_\_. Manual X. Operative Yes X, No \_\_\_\_\_.  
 Comments: Controls appeared to be in working order  
 No. 3 Location and Type: \_\_\_\_\_  
 Controls \_\_\_\_\_, Type: \_\_\_\_\_  
 Automatic \_\_\_\_\_. Manual \_\_\_\_\_. Operative Yes \_\_\_\_\_, No \_\_\_\_\_.  
 Comments: \_\_\_\_\_  
 Drawdown present Yes X, No \_\_\_\_\_. Operative Yes X, No \_\_\_\_\_.  
 Comments: See No. 2 above

7. DAM UPSTREAM FACE: Slope 3:1, Depth Water at Dam 3' to 5'  
 Conc.  
 Material: Turf X. Brush & Trees X. Rock fill \_\_\_\_\_. Masonry X. Wood \_\_\_\_\_.  
 Tower  
 Other \_\_\_\_\_  
 Condition: 1. Good \_\_\_\_\_. 3. Major Repairs X.  
 2. Minor Repairs \_\_\_\_\_. 4. Urgent Repairs \_\_\_\_\_.  
 Comments: Severe erosion of slope - several gullies 3' to 6' wide and 1½' to 3'  
deep - extending from top to toe of slope. Brush and large trees prevalent.

8. DAM DOWNSTREAM FACE: Slope 2:1.  
 Conc.  
 Material: Turf X. Brush & Trees X. Rock Fill \_\_\_\_\_. Masonry X. Wood \_\_\_\_\_.  
 Stilling Basin  
 Other \_\_\_\_\_  
 Condition: 1. Good \_\_\_\_\_. 3. Major Repairs \_\_\_\_\_.  
 2. Minor Repairs \_\_\_\_\_. 4. Urgent Repairs X.  
 Comments: Very severe erosion - large washouts - brush and trees - seepage areas - stilling  
basin outlet blocked by debris and outlet or storm drain appears to be collapsed  
in

**9. EMERGENCY SPILLWAY: Available No . Needed No .**Height Above Normal Water:                      Ft.Width                      Ft. Height                      Ft. Material                     .Condition:    1. Good                     .                      3. Major Repairs                     .  
                    2. Minor Repairs                     .                      4. Urgent Repairs                     .Comments: Capacity of spillway conduit exceeds capacity of 48" storm drain  
from stilling basin**10. WATER LEVEL AT TIME OF INSPECTION: 28<sup>+</sup> Ft. Above                     . Below X                     .**Top Dam X                      F.L. Principal Spillway                     .Other 21:5 feet below top of intake towerNormal Freeboard 28 Ft.**11. SUMMARY OF DEFICIENCIES NOTED:**Growth (Trees and Brush) on Embankment Yes - both slopes have brush & large tree growth.Yes - series of 1½' dia. x 2' deep holes along both edges ofAnimal Burrows and Washouts top of embankment - several gullies from surface runoff.Yes - see above - also damage from motor bikeDamage to Slopes or Top of Dam traffic on slopes and top of damCracked or Damaged Masonry None evidentEvidence of Seepage Yes - several areas of seepage notedEvidence of Piping None foundLeaks None foundErosion Yes - severe erosion occurring on slopes and top of damTrash and/or Debris Impeding Flow Yes - stilling basin full of debrisClogged or Blocked Spillway Yes - storm drain blocked by debris in stilling basin.Other Chain link fence around stilling basin practically non-existent. Access  
to stilling basin and outlet storm drain completely open to general public -  
cave-in of large stone masonry slabs over top of storm drain. This condition  
noted at last inspection.

- 4 -

(12.)

## OVERALL CONDITION:

1. Safe \_\_\_\_\_.
2. Minor repairs needed \_\_\_\_\_.
3. Conditionally safe - major repairs needed X \_\_\_\_\_.
4. Unsafe \_\_\_\_\_.
5. Reservoir impoundment no longer exists (explain)  
Recommend removal from inspection list \_\_\_\_\_.

(13.)

## REMARKS AND RECOMMENDATIONS: (Fully Explain)

There does not appear to have been any repair or maintenance work accomplished on this dam since last inspection of April 22, 1974. All conditions noted in that inspection have deteriorated further - see items #7, #8 and #11. The 48" storm drain which serves as an outlet for stilling basin is blocked by debris and there is evidence that stilling basin has overtopped in recent weeks at this point. Very severe erosion and a settlement of large paving stones over the top of storm drain has occurred. Some of these stones are as much as 3'± below surrounding natural ground.

Evidence indicates that trail bikes use this area extensively and have caused considerable erosion of top and slopes of embankment. Large gullies have washed into both slopes from channeling of surface runoff into these bike trails.

Because there appears to be some question as to which City Department is responsible for the operation and maintenance of the spillway structures, the District suggests that copies of any communication regarding this dam be sent to the Mayor of Springfield.

HTS/vk

(12)

## OVERALL CONDITION:

1. Safe\_\_\_\_\_.
2. Minor repairs needed\_\_\_\_\_.
3. Conditionally safe - major repairs needed X\_\_\_\_\_.
4. Unsafe\_\_\_\_\_.
5. Reservoir impoundment no longer exists (explain)  
Recommend removal from inspection list\_\_\_\_\_.

(13)

## REMARKS AND RECOMMENDATIONS: (Fully Explain)

There does not appear to have been any repair or maintenance work accomplished on this dam since last inspection of April 22, 1974. All conditions noted in that inspection have deteriorated further - see items #7, #8 and #11. The 48" storm drain which serves as an outlet for stilling basin is blocked by debris and there is evidence that stilling basin has overtopped in recent weeks at this point. Very severe erosion and a settlement of large paving stones over the top of storm drain has occurred. Some of these stones are as much as 3'± below surrounding natural ground.

Evidence indicates that trail bikes use this area extensively and have caused considerable erosion of top and slopes of embankment. Large gullies have washed into both slopes from channeling of surface runoff into these bike trails.

## ITEM #7 DAM-UPSTREAM FACE

COMMENTS - Severe erosion of slope. Several Gullies 3' to 6' wide and 1 1/2' to 3' deep, extending from top to toe of slope. Brush & large trees prevalent

## ITEM #8 DAM-DOWN STREAM FACE

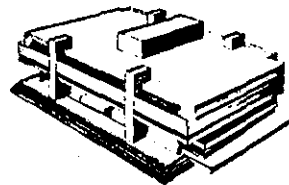
COMMENTS - Very Severe Erosion - large wash-outs - brush & Trees - Seepage areas - Stilling basin outlet blocked by debris and outlet or storm-drain appears to be collapsing -

## ITEM #11 SUMMARY OF DEFICIENCIES:

Growth of Trees & Brush on both embankments  
A series of 1 1/2' dia. by 20' deep holes along both edges of top of embankment - Several gullies from surface run-off.  
Damage from motor bike traffic on slopes and top of dam.  
Several areas of seepage noted  
Severe erosion on slopes and top of dam  
Stilling basin full of debris - Storm Drain blocked by debris  
Chain link fence around Stilling basin practically non-existent.  
Access to Stilling basin and outlet storm drain completely open to general public -



Commonwealth of Massachusetts  
County of Hampden  
Hall of Justice  
50 State Street  
Springfield, Massachusetts 01103



OFFICE OF THE  
COUNTY COMMISSIONERS

STEPHEN A. MOYNAHAN  
CHAIRMAN  
ARMANDO G. DIMAURO  
RICHARD S. THOMAS

May 25, 1978

Dippedds Abbedd McCarthy Draddon  
345 Park Ave.  
New York 10022

Attn: H. Feldmen

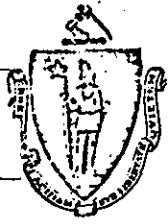
Sir:

These are the latest reports available in this office. There is also a record of all previous field studies by Tigh & Bond Consulting Engineers and G.H. McDonnell the former County hydraulic engineer. The only plan I have on file is of the Watershop dam as stated in the enclosed report.

Sincerely,

Frank A. Rueli, Jr.  
Engineer, Hampden County

NOTE: These are pertinent excerpts from original letter.



Commonwealth of Massachusetts

# County of Hampden

Springfield, Mass.

Office of the  
County Commissioners  
52 State Street

William F. Stapleton  
Chairman

~~Richard H. Wadsworth~~  
Floyd W. Fradet

Stephen A. Moynahan

December 10, 1969

Springfield Parks Commission  
Public Parks Department  
Forest Park Office  
Springfield, Massachusetts

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45, et seq. of the General Laws, Tercentenary Edition, relative to inspections, condition and safety of dams in Hampden County, you are hereby advised that your Middle Dam located in Forest Park and forming the lower of the two larger ponds, as well as your two dams located at Van Horn Park, have been inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him as related to the dams.

"Van Horn Park Lower Dam

The inlet structure and bar rack at both the lower portion of the structure and at the top of the structure were noted to be o.k.

The conduit thru the dam appeared to be taking on an elliptical shape at about the 1/4 to 1/3 point from the upstream end. Horizontal and vertical gauge points should be established inside the conduit for the purpose of periodically checking the vertical and the horizontal dimensions. The undersigned is of the opinion that there is some movement taking place which has changed the shape of the conduit.

Check and gauge points should be established at three different locations to provide facilities for periodically checking the vertical and horizontal dimensions of the conduit at these three different locations. Thus, twelve gauge points should be established.

Some longitudinal cracking of concrete was noted at the inside top of the conduit in the area where the undersigned is suspicious that motion has taken place.

The toe outlet facility at the end of the conduit was o.k. except for the fact that the entrance to the pipe from the outlet chamber is plugged with heavy debris.

A major storm would no doubt cause overflowing of the outlet structure since water would not be able to enter the drainpipe at design capacity.

The surface of the ground just downstream of the outlet structure and directly over the outlet pipe has settled. It would appear that surface water is making its way into the drainpipe either thru open joints or cracks in the pipe.

The embankment itself is poorly maintained, but because of its massive size in relation to the quantity of water stored, the embankment is safe. Many trees grow from the surface of the embankment, including both slopes, and there is little or no turf cover on the sandy material of the embankment.

The owner should install the recommended twelve gauge and check points within the conduit, should clean the debris from the outlet facility at the toe of the dam, and should take steps as necessary to prevent washing of soil into the conduit pipe just below the outlet facility."

The work recommended by the County Hydraulic Engineer should be accomplished during the coming year. It is essential that the dams be properly maintained and that personnel of your Department do the needed routine maintenance.

Inspections of these dams will be made again during the summer of 1970 by which time it is anticipated you will have completed the work as recommended by the County Hydraulic Engineer.

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Very truly yours,

BOARD OF COUNTY COMMISSIONERS

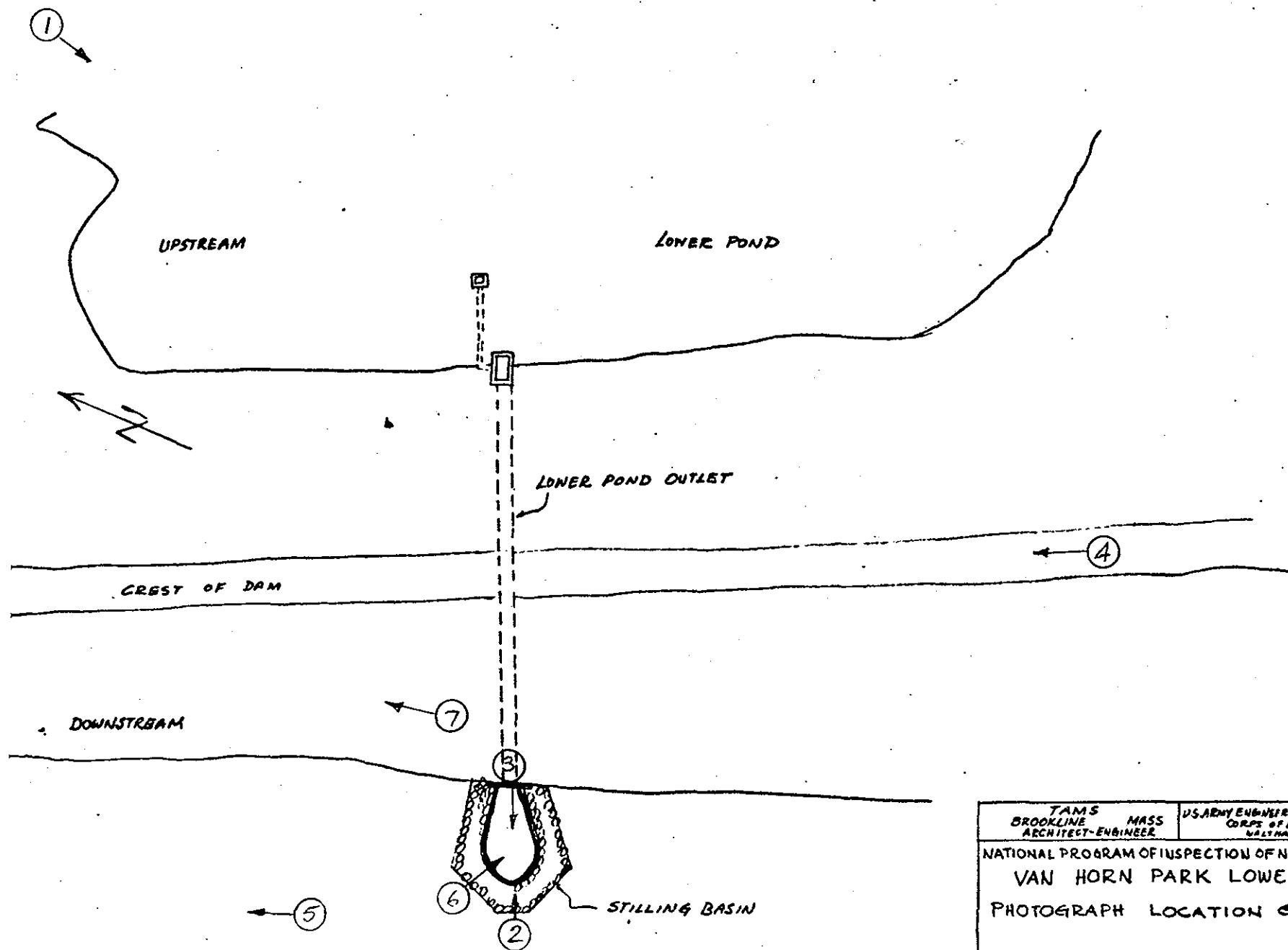
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## PHOTOGRAPHS

## APPENDIX C



|                                                 |  |                                                                              |  |
|-------------------------------------------------|--|------------------------------------------------------------------------------|--|
| TAMS<br>BROOKLINE MASS<br>ARCHITECT-ENGINEER    |  | US ARMY ENGINEER DISTRICT NEW ENGLAND<br>CORPS OF ENGINEERS<br>WALTHAM, MASS |  |
| NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS |  |                                                                              |  |
| VAN HORN PARK LOWER                             |  |                                                                              |  |
| PHOTOGRAPH LOCATION GUIDE                       |  |                                                                              |  |
| CONNECTICUT RIVER BASIN                         |  | MASS                                                                         |  |
|                                                 |  | SCALE: NTS                                                                   |  |
|                                                 |  | DATE: JULY 78                                                                |  |



② STILLING BASIN SHOWING 72" DIAMETER CONDUIT OUTLET



③ STILLING BASIN, SHOWING 48" DIAMETER OUTLET  
CONDUIT BLOCKED BY DEBRIS AND BROOK DRAIN TROUGH



④ DOWNSTREAM SLOPE LOOKING SOUTH SHOWING EXTENSIVE VEGETATION



⑤ DOWNSTREAM SLOPE LOOKING NORTH SHOWING  
EXTENSIVE VEGETATION AND RUTTING



⑥ VIEW OF CREST SHOWING BIKE TRAIL AND EXTENSIVE VEGETATION



⑦ DOWNSTREAM TOE SHOWING BROOK AND LOW LEVEL  
OUTLET OF VAN HORN PARK UPPER DAM

## HYDROLOGIC DATA & COMPUTATIONS

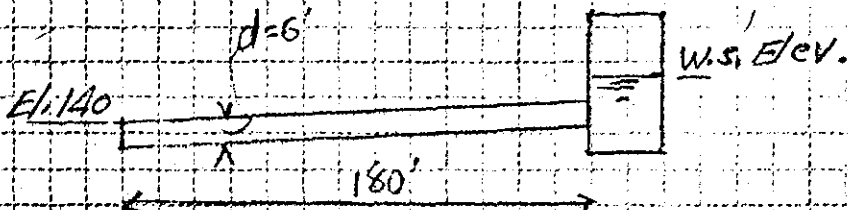
### APPENDIX D



# TAMS

Job No. 1497-09  
 Project Dam Inspection - Van Horn Park  
 Subject Lower Dam, Capacity of Spillway Pipe.

Sheet        of         
 Date 6/4/78  
 By GRW  
 Ch'k. by       



Assume Elev. in Shaft = 148

$$H = 148 - 140 = 8' \quad A = \frac{\pi D^2}{4} = 28.3 \text{ ft}^2$$

$$S = \frac{8}{180} = 0.044$$

$$V = \frac{0.590}{n} D^{\frac{2}{3}} S^{\frac{1}{2}} = \frac{0.590}{0.015} (6^{\frac{2}{3}}) (0.044)^{\frac{1}{2}} = 19.3' / \text{sec.}$$

$$Q = AV = (28.3)(19.3) = 545.6 \text{ cfs.}$$

Assume Elev. in shaft = 152

$$H = 12'$$

$$S = \frac{12}{180} = 0.066$$

$$V = \frac{0.590}{0.015} (6)^{\frac{2}{3}} (0.066)^{\frac{1}{2}} = 33.54$$

$$Q = AV = (28.3)(33.54) = 949 \text{ cfs.}$$

Assume Elev. in Shaft = 158

$$H = 158 - 140 = 18'$$

$$S = \frac{18}{180} = 0.10$$

$$V = \frac{0.590}{0.015} (6)^{\frac{2}{3}} (0.10)^{\frac{1}{2}} = 41.3' / \text{sec.}$$

$$Q = AV = (28.3)(41.3) = 1168 \text{ cfs}$$

← Discharge  
 greater than  
 capacity of inlet

Job No. 1497-10 TIPPETTS-ABBETT-McCARTHY-STRATTON  
 Project DAM INSPECTION ENGINEERS AND ARCHITECTS NEW YORK  
 Subject INFLOW FOR LOWER DAM WITH UPPER DAM FAILURE  
at Hour 55+

Sheet      of       
 Date 6/18/78  
 By D.L.C.  
 Ch'k. by     

| HOUR | INFLOW<br>FROM UPPER<br>DAM (cfs) | INFLOW<br>FROM DAM<br>FAILURE (cfs) | UNCONTROLLED<br>AREA INFLOW<br>cfs | INFLOW<br>INTO UPPER<br>DAM cfs | TOTAL<br>INFLOW |
|------|-----------------------------------|-------------------------------------|------------------------------------|---------------------------------|-----------------|
| 0    |                                   |                                     |                                    |                                 |                 |
| 1.0  | 0                                 | -                                   | 9.2                                | -                               | 9.2             |
| 1.5  | 12.6                              | -                                   | 19.0                               | -                               | 31.6            |
| 2.0  | 31.4                              | -                                   | 28.8                               | -                               | 60.2            |
| 2.5  | 58.7                              | -                                   | 46.1                               | -                               | 104.8           |
| 3.0  | 99.3                              | -                                   | 63.4                               | -                               | 162.7           |
| 3.5  | 178.7                             | -                                   | 108.0                              | -                               | 286.7           |
| 4.0  | 300.6                             | -                                   | 152.6                              | -                               | 453.2           |
| 4.5  | 461.6                             | -                                   | 205.9                              | -                               | 667.5           |
| 5.0  | 655.2                             | -                                   | 259.2                              | -                               | 914.4           |
| 5.5  | 755.2                             | -                                   | 169.9                              | -                               | 925.1           |
| 6.0  | -                                 | 750                                 | 80.6                               | 367                             | 1197.6          |
| 6.5  | -                                 | 1481                                | 64.8                               | 295                             | 1840.8          |
| 7.0  | -                                 | 1110                                | 19.0                               | 223                             | 1382.           |
| 7.5  | -                                 | 740                                 | 29.1                               | 132.5                           | 901.6           |
| 8.0  | -                                 | 370                                 | 9.2                                | 42.                             | 421.2           |
| 8.5  | -                                 | -                                   | 9.2                                | 42.                             | 51.2            |
| 9.0  | -                                 | -                                   | 9.2                                | 42.                             | 51.2            |

Job No. 1497-10 TIPPETTS-ABBETT-McCARTHY-STRATTON  
 Project DAM INSPECTION ENGINEERS AND ARCHITECTS NEW YORK  
 Subject STORAGE TABLE FOR LOWER DAM

Sheet      of       
 Date       
 By D.L.C.  
 Chk. by     

| ELEVATION | AREA | MEAN AREA | ΔVOL  | VOL (Acres foot.) |
|-----------|------|-----------|-------|-------------------|
| ✓146.5    | 5.8  |           |       | 0                 |
| ✓148      | 6.4  | 6.1       | 9.2   | 9.2               |
| ✓150      | 7.2  | 6.8       | 13.6  | 22.8              |
| ✓152      | 8.0  | 7.6       | 15.2  | 38                |
| ✓154      | 8.8  | 8.4       | 16.8  | 54.8              |
| ✓156      | 9.7  | 9.25      | 18.5  | 73.3              |
| ✓158      | 10.5 | 10.1      | 20.2  | 93.5              |
| ✓160      | 11.3 | 10.9      | 21.8  | 115.3             |
| ✓162      | 12.2 | 11.75     | 23.5  | 138.8             |
| ✓164      | 13.0 | 12.6      | 25.2  | 164               |
| ✓166      | 13.8 | 13.4      | 26.8  | 190.8             |
| ✓168      | 14.7 | 14.2      | 28.4  | 219.2             |
| ✓169      | 15.1 | 14.9      | 14.9  | 234.1             |
| ✓170      | 15.6 | 15.35     | 15.35 | 249.5             |
| ✓171      | 15.9 | 15.75     | 15.75 | 265.3             |
| ✓172      | 16.8 | 16.35     | 16.35 | 281.7             |
| 174       |      |           |       | 315.7             |

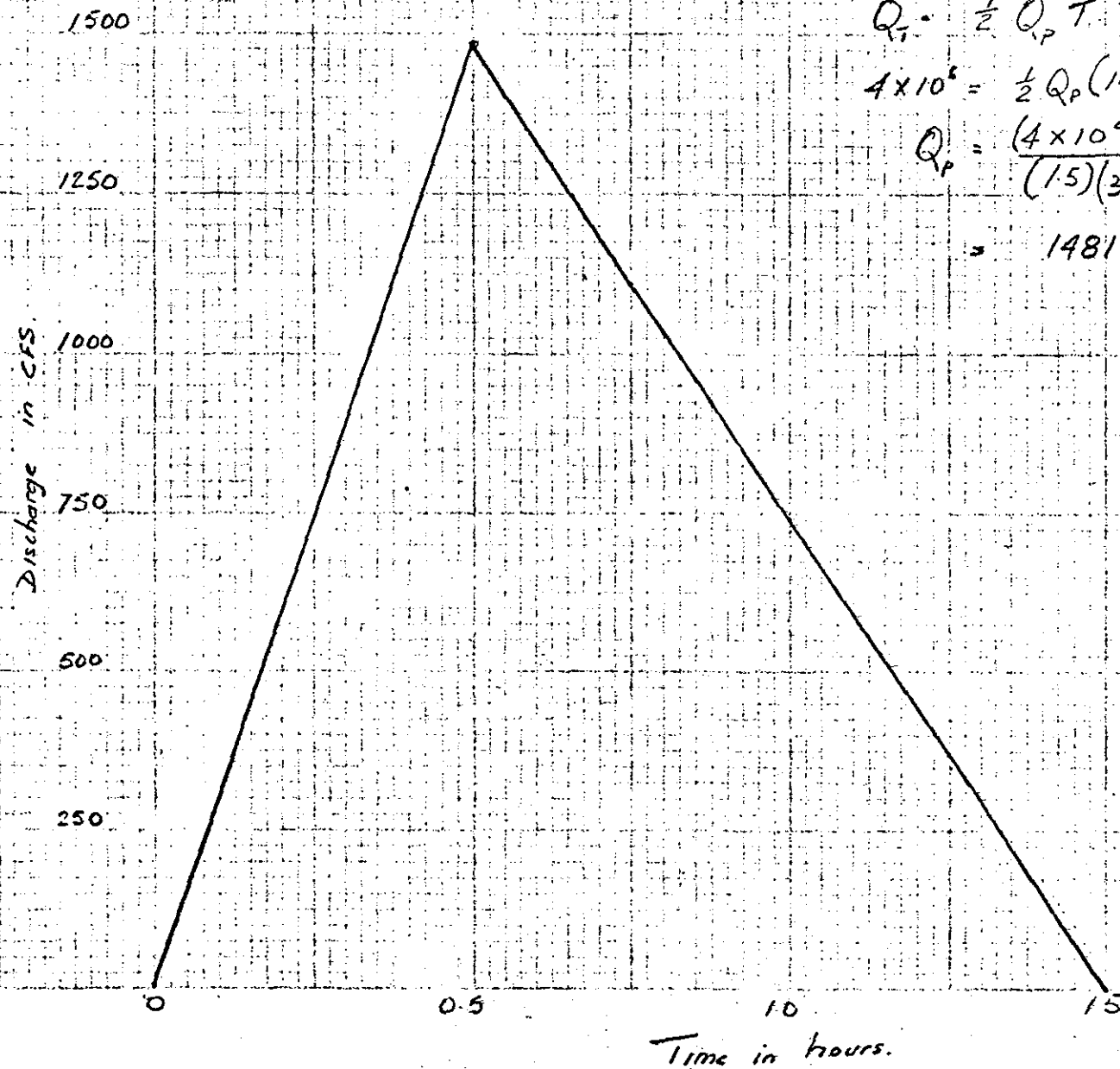
Job No. 1297-10 TIPPETTS-ABBETT-McCARTHY-STRATTON  
 Project Dam Inspection, Van Horn Park ENGINEERS AND ARCHITECTS NEW YORK  
 Subject Outflow Rating, Lower Dam

Sheet      of       
 Date 6/12/78  
 By GLW  
 Ch'k. by     

| Elev.   | Orifice <sup>✓</sup><br>(cfs)<br>$C_d \sqrt{2gh}$ | Weir | Total<br>outflow | L = 36.0' | C = 3.3 |
|---------|---------------------------------------------------|------|------------------|-----------|---------|
| ✓ 146.5 | 0                                                 | --   | 0                |           |         |
| ✓ 148   | 10.6                                              | --   | 11               |           |         |
| ✓ 149   | 18.5                                              | -    | 18               |           |         |
| ✓ 150   | 23.9                                              | -    | 24               |           |         |
| ✓ 152   | 32.0                                              | -    | 32               |           |         |
| ✓ 154   | 38.5                                              | -    | 38               |           |         |
| ✓ 156   | 44.0                                              | -    | 44               |           |         |
| ✓ 158   | 48.9                                              | -    | 49               |           |         |
| ✓ 160   | 53.4                                              | -    | 53               |           |         |
| ✓ 162   | 57.5                                              | -    | 58               |           |         |
| ✓ 164   | 61.3                                              | -    | 61               |           |         |
| ✓ 166   | 64.9                                              | -    | 65               |           |         |
| ✓ 168   | 68.4                                              | 0    | 68               |           |         |
| ✓ 169   | 70.0                                              | 119  | 189              |           |         |
| ✓ 170   | 71.6                                              | 336  | 408              |           |         |
| ✓ 171   | 73.2 ✓                                            | 617  | 690              |           |         |
| ✓ 172   | 67.5                                              | 950  | 1018             |           |         |

Use 1 ft. intervals {

17 ✓ Neglect 12" pipe



$$Q_i = \frac{1}{2} Q_p T$$

$$4 \times 10^6 = \frac{1}{2} Q_p (1.5)(3600)$$

$$Q_p = \frac{(4 \times 10^6)(2)}{(1.5)(3600)}$$

$$= 1481.48$$

VAN HOAN PARK

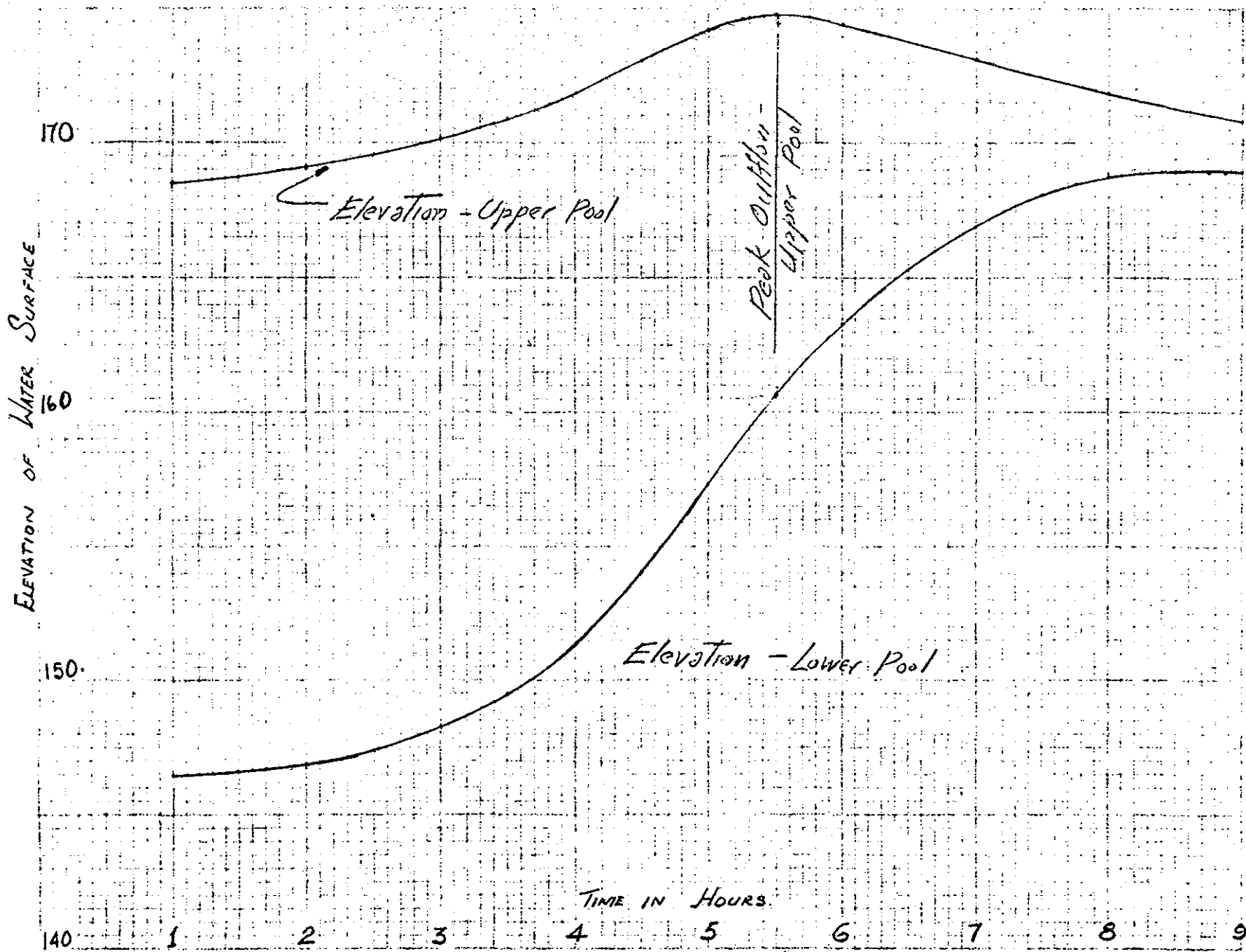
TYPET'S ABLETT-MCCARTHY/STRATTON  
ENGINEERS & ARCHITECTS NEW YORK

PROPOSED FLOOD HYDROGRAPH  
RESULTING FROM FAILURE OF  
LIPPER DAM

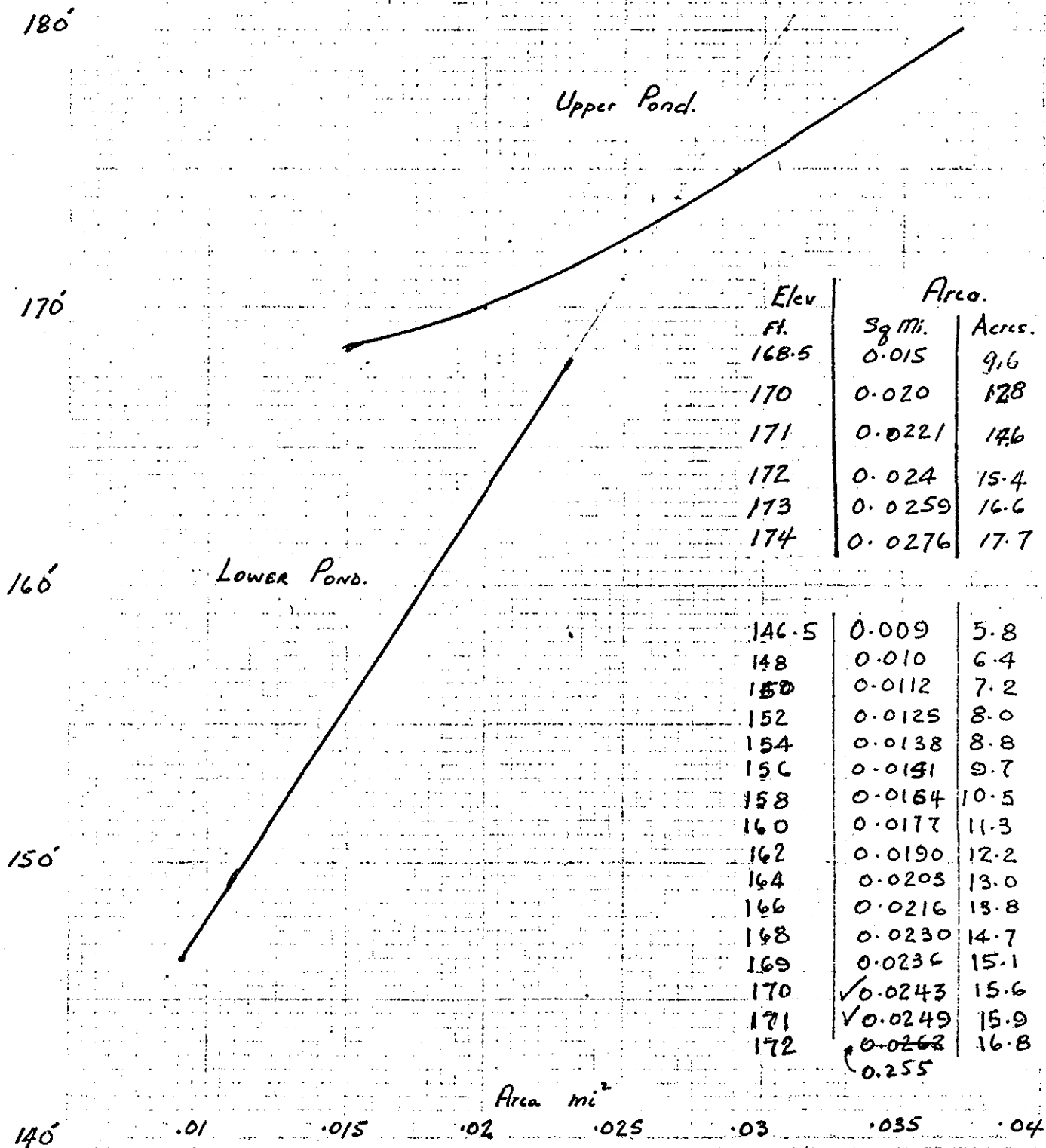
DATE: June 18

BY: D.L.C.

REVISION NUMBER



|                                                                             |                                                           |
|-----------------------------------------------------------------------------|-----------------------------------------------------------|
| TIPPETT, ABBETT, MCCARTHY, STRATTON<br>ENGINEERS AND ARCHITECTS<br>NEW YORK | VAN HORN PARK DAM                                         |
| BY D.L.C. DATE June 18<br>DRAWING NUMBER                                    | Routing of Design Flood -<br>Relation between Pond Levels |



|                                          |  |                                                                       |       |
|------------------------------------------|--|-----------------------------------------------------------------------|-------|
| Van Horn Park Dam.                       |  | TIPETTS-ABUETT-McCARTHY-STRATTON<br>ENGINEERS and ARCHITECTS NEW YORK |       |
| JOB# 1497-09, 10. AREA-ELEVATION CURVES. |  | BY:                                                                   | DATE: |
|                                          |  | DRAWING NUMBER:                                                       |       |

DAM INSPECTION  
VAN HORN PARK  
OUTFLOW RATING, LOWER DAM

## INPUT PARAMETERS

| STARTING<br>ELEV<br>(FT.) | TIME<br>INTERVAL<br>(HOURS) | STARTING<br>TIME<br>(HOURS) | ENDING<br>TIME<br>(HOURS) | PRINT<br>INTERVAL | GATE<br>OPTION | PLOT<br>OPTION | STORAGE<br>COEF. | OUTFLOW<br>COEF. | INFLOW<br>COEF. | TIME<br>COEF. | BREAK<br>TIME |
|---------------------------|-----------------------------|-----------------------------|---------------------------|-------------------|----------------|----------------|------------------|------------------|-----------------|---------------|---------------|
| 146.50                    | 0.12                        | 1.00                        | 9.00                      | 1                 | NO             | NO             | 1.000            | 1.000            | 1.000           | 1.000         | 0.000         |

| RESERVOIR<br>ELEV.<br>(FT.) | RESERVOIR<br>STORAGE<br>(ACFT) | RESERVOIR<br>OUTFLOW<br>(CFS) |
|-----------------------------|--------------------------------|-------------------------------|
| 146.50                      | 0.0000                         | 0.00                          |
| 148.00                      | 9.2000                         | 11.00                         |
| 150.00                      | 22.8000                        | 24.00                         |
| 152.00                      | 38.0000                        | 32.00                         |
| 154.00                      | 54.8000                        | 38.00                         |
| 156.00                      | 73.3000                        | 44.00                         |
| 158.00                      | 93.5000                        | 49.00                         |
| 160.00                      | 115.3000                       | 53.00                         |
| 162.00                      | 138.8000                       | 58.00                         |
| 164.00                      | 164.0000                       | 61.00                         |
| 166.00                      | 190.8000                       | 65.00                         |
| 168.00                      | 219.2000                       | 68.00                         |
| 169.00                      | 234.1000                       | 189.00                        |
| 170.00                      | 249.5000                       | 408.00                        |
| 171.00                      | 265.3000                       | 690.00                        |
| 172.00                      | 281.7000                       | 1018.00                       |

| TIME<br>(HRS)  | INFLOW<br>(CFS) | OUTFLOW<br>(CFS) | STORAGE<br>(ACFT) | ELEVATION<br>(FT.) |
|----------------|-----------------|------------------|-------------------|--------------------|
| 1.00           | 9.20            |                  | 0.0000            | 146.50             |
| 1.13           | 14.79           | 0.14             | 0.1232            | 146.52             |
| 1.25           | 20.40           | 0.36             | 0.3023            | 146.54             |
| 1.38           | 26.00           | 0.64             | 0.5368            | 146.58             |
| 1.50           | 31.59           | 0.98             | 0.8259            | 146.63             |
| 1.63           | 38.75           | 1.40             | 1.1769            | 146.69             |
| 1.75           | 45.90           | 1.90             | 1.5970            | 146.76             |
| 1.88           | 53.05           | 2.49             | 2.0854            | 146.84             |
| 2.00           | 60.20           | 3.15             | 2.6412            | 146.93             |
| 2.13           | 71.35           | 3.92             | 3.2840            | 147.03             |
| 2.25           | 82.50           | 4.82             | 4.0335            | 147.15             |
| 2.38           | 93.64           | 5.84             | 4.8883            | 147.29             |
| 2.50           | 104.80          | 6.99             | 5.8470            | 147.45             |
| 2.63           | 119.27          | 8.28             | 6.9255            | 147.62             |
| 2.75           | 133.75          | 9.73             | 8.1394            | 147.82             |
| 2.88           | 148.22          | 11.27            | 9.4871            | 148.04             |
| 3.00           | 162.70          | 12.69            | 10.9694           | 148.26             |
| 3.13           | 193.69          | 14.31            | 12.6707           | 148.51             |
| 3.25           | 224.69          | 16.23            | 14.6741           | 148.80             |
| 3.38           | 255.69          | 18.43            | 16.9764           | 149.14             |
| 3.50           | 286.70          | 20.91            | 19.5748           | 149.52             |
| 3.63           | 328.32          | 23.73            | 22.5209           | 149.95             |
| 3.75           | 369.95          | 25.61            | 25.8724           | 150.40             |
| 3.88           | 315.97 411.57   | 27.59            | 29.6343           | 150.89             |
| 4.00           | 2523.81 453.20  | 29.79            | 33.8046           | 151.44             |
| 4.13           | 506.77          | 32.15            | 38.4429           | 152.05             |
| 4.25           | 560.35          | 34.00            | 43.6132           | 152.66             |
| 4.38           | 613.92          | 36.04            | 49.3168           | 153.34             |
| 4.50           | 667.50          | 38.24            | 55.5519           | 154.08             |
| 4.63           | 729.22          | 40.45            | 62.3599           | 154.81             |
| 4.75           | 790.95          | 42.85            | 69.7817           | 155.61             |
| 4.88           | 852.67          | 45.11            | 77.8162           | 156.44             |
| 5.00           | 914.40          | 47.25            | 86.4664           | 157.30             |
| 5.13           | 917.07          | 49.35            | 95.4271           | 158.17             |
| 5.25           | 919.75          | 50.99            | 104.3964          | 158.99             |
| 5.38           | 922.42          | 52.64            | 113.3764          | 159.82             |
| Failure - 5.50 | 925.10          | 54.50            | 122.3661          | 160.60             |
| 5.63           | 887.10          | 56.37            | 131.1539          | 161.34             |
| 5.75           | 849.10          | 58.08            | 139.5304          | 162.05             |
| 5.88           | 811.10          | 59.03            | 147.5009          | 162.69             |
| 6.00           | 773.10          | 59.93            | 155.0692          | 163.29             |
| 6.13           | 739.95          | 60.79            | 162.2609          | 163.86             |
| 6.25           | 706.80          | 61.76            | 169.1009          | 164.38             |
| 6.38           | 673.65          | 62.72            | 175.5883          | 164.86             |
| 6.50           | 640.50          | 63.64            | 181.7235          | 165.32             |
| 6.63           | 610.95          | 64.51            | 187.5256          | 165.75             |
| 6.75           | 581.40          | 65.23            | 193.0139          | 166.15             |
| 6.88           | 551.84          | 65.78            | 198.1907          | 166.52             |
| 7.00           | 522.30          | 66.29            | 203.0568          | 166.86             |

| TIME<br>(HRS)                                                  | INFLOW<br>(CFS) | OUTFLOW<br>(CFS) | STORAGE<br>(ACFT) | ELEVATION<br>(FT.) |
|----------------------------------------------------------------|-----------------|------------------|-------------------|--------------------|
| 7.13                                                           | 494.09          | 66.77            | 207.6194          | 167.18             |
| 7.25                                                           | 465.90          | 67.22            | 211.8859          | 167.48             |
| 7.38                                                           | 437.70          | 67.64            | 215.8565          | 167.76             |
| 7.50                                                           | 409.50          | 70.65            | 219.5271          | 168.02             |
| 7.63                                                           | 382.00          | 96.81            | 222.7485          | 168.23             |
| 7.75                                                           | 354.50          | 118.65           | 225.4382          | 168.41             |
| 7.88                                                           | 327.00          | 136.53           | 227.6389          | 168.56             |
| 8.00                                                           | 299.50          | 150.75           | 229.3900          | 168.68             |
| 8.13                                                           | 281.27          | 161.98           | 230.7737          | 168.77             |
| 8.25                                                           | 263.05          | 170.85           | 231.8654          | 168.85             |
| 8.38                                                           | 244.82          | 177.53           | 232.6886          | 168.90             |
| 8.50                                                           | 226.60          | 182.22           | 233.2651          | 168.94             |
| 8.63                                                           | 214.25          | 185.29           | 233.6437          | 168.96             |
| 8.75                                                           | 201.89          | 187.12           | 233.8694          | 168.98             |
| 8.88                                                           | 189.54          | 187.81           | 233.9545          | 168.99             |
| 9.00                                                           | 177.20          | 187.46           | 233.9105          | 168.98             |
| <div> <div>25323.24 = 137 d.s.f.</div> <div>9.81"</div> </div> |                 |                  |                   |                    |
| MAX. VALUES                                                    | 925.10          | 187.81           |                   | 168.99             |
| MIN. VALUES                                                    | 9.20            | 0.00             |                   | 146.50             |

DAM INSPECTION  
VAN HORN PARK  
INFLOW FOR LOWER DAM WITH UPPER DAM FAILURE  
AT HOURS 5.5+

INPUT PARAMETERS

| STARTING<br>ELEV<br>(FT.) | TIME<br>INTERVAL<br>(HOURS) | STARTING<br>TIME<br>(HOURS) | ENDING<br>TIME<br>(HOURS) | PRINT<br>INTERVAL | GATE<br>OPTION | PLOT<br>OPTION | STORAGE<br>COEF. | OUTFLOW<br>COEF. | INFLOW<br>COEF. | TIME<br>COEF. | BREAK<br>TIME |
|---------------------------|-----------------------------|-----------------------------|---------------------------|-------------------|----------------|----------------|------------------|------------------|-----------------|---------------|---------------|
| 146.50                    | 0.12                        | 1.00                        | 9.00                      | 1                 | NO             | NO             | 1.000            | 1.000            | 1.000           | 1.000         | 0.000         |

| RESERVOIR<br>ELEV.<br>(FT.) | RESERVOIR<br>STORAGE<br>(ACFT) | RESERVOIR<br>OUTFLOW<br>(CFS) |
|-----------------------------|--------------------------------|-------------------------------|
| 146.50                      | 0.0000                         | 0.00                          |
| 148.00                      | 9.2000                         | 11.00                         |
| 150.00                      | 22.8000                        | 24.00                         |
| 152.00                      | 38.0000                        | 32.00                         |
| 154.00                      | 54.8000                        | 38.00                         |
| 156.00                      | 73.3000                        | 44.00                         |
| 158.00                      | 93.5000                        | 49.00                         |
| 160.00                      | 115.3000                       | 53.00                         |
| 162.00                      | 138.8000                       | 58.00                         |
| 164.00                      | 164.0000                       | 61.00                         |
| 166.00                      | 190.8000                       | 65.00                         |
| 168.00                      | 219.2000                       | 68.00                         |
| 169.00                      | 234.1000                       | 189.00                        |
| 170.00                      | 249.5000                       | 408.00                        |
| 171.00                      | 265.3000                       | 690.00                        |
| 172.00                      | 281.7000                       | 1018.00                       |
| 174.00                      | 315.7000                       | 1750.00                       |
| 180.00                      | 426.4000                       | 4950.00                       |

| TIME<br>(HRS) | INFLOW<br>(CFS) | OUTFLOW<br>(CFS) | STORAGE<br>(ACFT) | ELEVATION<br>(FT.) |
|---------------|-----------------|------------------|-------------------|--------------------|
| 1.00          | 9.20            |                  | 0.0000            | 146.50             |
| 1.13          | 14.79           | 0.14             | 0.1232            | 146.52             |
| 1.25          | 20.40           | 0.36             | 0.3023            | 146.54             |
| 1.38          | 26.00           | 0.64             | 0.5368            | 146.58             |
| 1.50          | 31.59           | 0.98             | 0.8259            | 146.63             |
| 1.63          | 38.75           | 1.40             | 1.1769            | 146.69             |
| 1.75          | 45.90           | 1.90             | 1.5970            | 146.76             |
| 1.88          | 53.05           | 2.49             | 2.0854            | 146.84             |
| 2.00          | 60.20           | 3.15             | 2.6412            | 146.93             |
| 2.13          | 71.35           | 3.92             | 3.2840            | 147.03             |
| 2.25          | 82.50           | 4.82             | 4.0335            | 147.15             |
| 2.38          | 93.64           | 5.84             | 4.8883            | 147.29             |
| 2.50          | 104.80          | 6.99             | 5.8470            | 147.45             |
| 2.63          | 119.27          | 8.28             | 6.9255            | 147.62             |
| 2.75          | 133.75          | 9.73             | 8.1394            | 147.82             |
| 2.88          | 148.22          | 11.27            | 9.4871            | 148.04             |
| 3.00          | 162.70          | 12.69            | 10.9694           | 148.26             |
| 3.13          | 193.69          | 14.31            | 12.6707           | 148.51             |
| 3.25          | 224.69          | 16.23            | 14.6741           | 148.80             |
| 3.38          | 255.69          | 18.43            | 16.9764           | 149.14             |
| 3.50          | 286.70          | 20.91            | 19.5748           | 149.52             |
| 3.63          | 328.32          | 23.73            | 22.5209           | 149.95             |
| 3.75          | 369.95          | 25.61            | 25.8724           | 150.40             |
| 3.88          | 411.57          | 27.59            | 29.6343           | 150.89             |
| 4.00          | 453.20          | 29.79            | 33.8046           | 151.44             |
| 4.13          | 506.77          | 32.15            | 38.4429           | 152.05             |
| 4.25          | 560.35          | 34.00            | 43.6132           | 152.66             |
| 4.38          | 613.92          | 36.04            | 49.3168           | 153.34             |
| 4.50          | 667.50          | 38.24            | 55.5519           | 154.08             |
| 4.63          | 729.22          | 40.45            | 62.3599           | 154.81             |
| 4.75          | 790.95          | 42.85            | 69.7817           | 155.61             |
| 4.88          | 852.67          | 45.11            | 77.8162           | 156.44             |
| 5.00          | 914.40          | 47.25            | 86.4664           | 157.30             |
| 5.13          | 917.07          | 49.35            | 95.4271           | 158.17             |
| 5.25          | 919.75          | 50.99            | 104.3964          | 158.99             |
| 5.38          | 922.42          | 52.64            | 113.3764          | 159.82             |
| 5.50          | 925.10          | 54.50            | 122.3661          | 160.60             |
| 5.63          | 993.22          | 56.48            | 131.7015          | 161.39             |
| 5.75          | 1061.35         | 58.34            | 141.7198          | 162.23             |
| 5.88          | 1129.47         | 59.62            | 152.4267          | 163.08             |
| 6.00          | 1197.60         | 60.97            | 163.8238          | 163.98             |
| 6.13          | 1358.39         | 62.84            | 176.3866          | 164.92             |
| 6.25          | 1519.19         | 64.96            | 190.5900          | 165.98             |
| 6.38          | 1680.00         | 66.65            | 206.4349          | 167.10             |
| 6.50          | 1840.80         | 105.82           | 223.8576          | 168.31             |
| 6.63          | 1726.10         | 278.79           | 240.4142          | 169.41             |
| 6.75          | 1611.40         | 483.70           | 253.7414          | 170.26             |
| 6.88          | 1496.70         | 663.92           | 263.8391          | 170.90             |
| 7.00          | 1382.00         | 806.02           | 271.1011          | 171.35             |

Begin  
to failure →

| TIME<br>(HRS) | INFLOW<br>(CFS) | OUTFLOW<br>(CFS) | STORAGE<br>(ACFT) | ELEVATION<br>(FT.) |
|---------------|-----------------|------------------|-------------------|--------------------|
| 7.13          | 1261.90         | 902.32           | 275.9163          | 171.64             |
| 7.25          | 1141.80         | 958.23           | 278.7117          | 171.81             |
| 7.38          | 1021.70         | 981.28           | 279.8645          | 171.88             |
| 7.50          | 901.60          | 977.62           | 279.6811          | 171.87             |
| 7.63          | 781.50          | 952.22           | 278.4111          | 171.79             |
| 7.75          | 661.40          | 909.14           | 276.2572          | 171.66             |
| 7.88          | 541.30          | 851.69           | 273.3845          | 171.49             |
| 8.00          | 421.20          | 782.54           | 269.9271          | 171.28             |
| 8.13          | 328.70          | 706.46           | 266.1230          | 171.05             |
| 8.25          | 236.20          | 633.54           | 262.1370          | 170.79             |
| 8.38          | 143.70          | 558.85           | 257.9521          | 170.53             |
| 8.50          | 51.20           | 481.16           | 253.5992          | 170.25             |
| 8.63          | 51.20           | 408.76           | 249.5429          | 170.00             |
| 8.75          | 51.20           | 359.77           | 246.1088          | 169.77             |
| 8.88          | 51.20           | 317.61           | 243.1441          | 169.58             |
| 9.00          | 51.20           | 281.21           | 240.5845          | 169.42             |
| MAX. VALUES   | 1840.80         | 981.28           |                   | 171.88             |
| MIN. VALUES   | 9.20            | 0.00             |                   | 146.50             |

APPENDIX E  
INFORMATION AS CONTAINED IN  
THE NATIONAL INVENTORY OF DAMS



## INVENTORY OF DAMS IN THE UNITED STATES

| STATE | IDENTITY NUMBER | DIVISION | STATE | COUNTY | CONGR. DIST. | STATE | COUNTY | CONGR. DIST. | NAME                    | LATITUDE (NORTH) | LONGITUDE (WEST) | REPORT DATE<br>DAY   MO   YR |
|-------|-----------------|----------|-------|--------|--------------|-------|--------|--------------|-------------------------|------------------|------------------|------------------------------|
| MA    | 571             | NED      | MA    | 013    | 02           |       |        |              | VAN HORN PARK LOWER DAM | 4207,5           | 7235,9           | 28JUL78                      |

| POPULAR NAME | NAME OF IMPOUNDMENT      |
|--------------|--------------------------|
|              | VAN HORN PARK LOWER POND |

| REGION | BASIN | RIVER OR STREAM      | NEAREST DOWNSTREAM CITY-TOWN-VILLAGE | DIST FROM DAM (MI.) | POPULATION |
|--------|-------|----------------------|--------------------------------------|---------------------|------------|
| 01     | 08    | TR-CONNECTICUT RIVER | SPRINGFIELD                          | 0                   | 164000     |

| TYPE OF DAM | YEAR COMPLETED | PURPOSES | STRUCTURAL HEIGHT (FT.) | HYDRAULIC HEIGHT (FT.) | IMPOUNDING CAPACITIES |                   | DIST | OWN | FED R | PRV/FED | SCS A | VER/DATE |
|-------------|----------------|----------|-------------------------|------------------------|-----------------------|-------------------|------|-----|-------|---------|-------|----------|
|             |                |          |                         |                        | MAXIMUM (ACRE-FT.)    | NORMAL (ACRE-FT.) |      |     |       |         |       |          |
| REPG        | 1957           | R        | 40                      | 35                     | 316                   | 219               | NED  | N   | N     | N       | N     | 28JUL78  |

| REMARKS |
|---------|
|         |

| (7)        | (8)             | (9)  | (10)           | (11)                          | (12)                     | (13)              | (14)             | (15)             | (16)            | (17)           | (18)            | (19)           | (20)            | (21)           | (22)            | (23)           | (24) | (25) |
|------------|-----------------|------|----------------|-------------------------------|--------------------------|-------------------|------------------|------------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|------|------|
| D/S<br>HAS | SPILLWAY        |      |                | MAXIMUM<br>DISCHARGE<br>(FT.) | VOLUME<br>OF DAM<br>(CY) | POWER CAPACITY    |                  | NAVIGATION LOCKS |                 |                |                 |                |                 |                |                 |                |      |      |
|            | CHEST<br>LENGTH | TYPE | WIDTH<br>(FT.) |                               |                          | INSTALLED<br>(MW) | PROPOSED<br>(MW) | NO.              | LENGTH<br>(FT.) | WIDTH<br>(FT.) | LENGTH<br>(FT.) | WIDTH<br>(FT.) | LENGTH<br>(FT.) | WIDTH<br>(FT.) | LENGTH<br>(FT.) | WIDTH<br>(FT.) |      |      |
| 1          | 600             | U    | 36             | 900                           | 52000                    |                   |                  |                  |                 |                |                 |                |                 |                |                 |                |      |      |

| OWNER               | ENGINEERING BY | CONSTRUCTION BY |
|---------------------|----------------|-----------------|
| CITY OF SPRINGFIELD |                |                 |

| REGULATORY AGENCY |              |           |             |
|-------------------|--------------|-----------|-------------|
| DESIGN            | CONSTRUCTION | OPERATION | MAINTENANCE |
| NONE              | NONE         | NONE      | NONE        |

| INSPECTION BY                     | INSPECTION DATE<br>DAY   MO   YR | AUTHORITY FOR INSPECTION |
|-----------------------------------|----------------------------------|--------------------------|
| TIPPETTS-ABBETT-MCCARTHY-STRATTON | 01JUN78                          | +L 92-367                |

| REMARKS |
|---------|
|         |